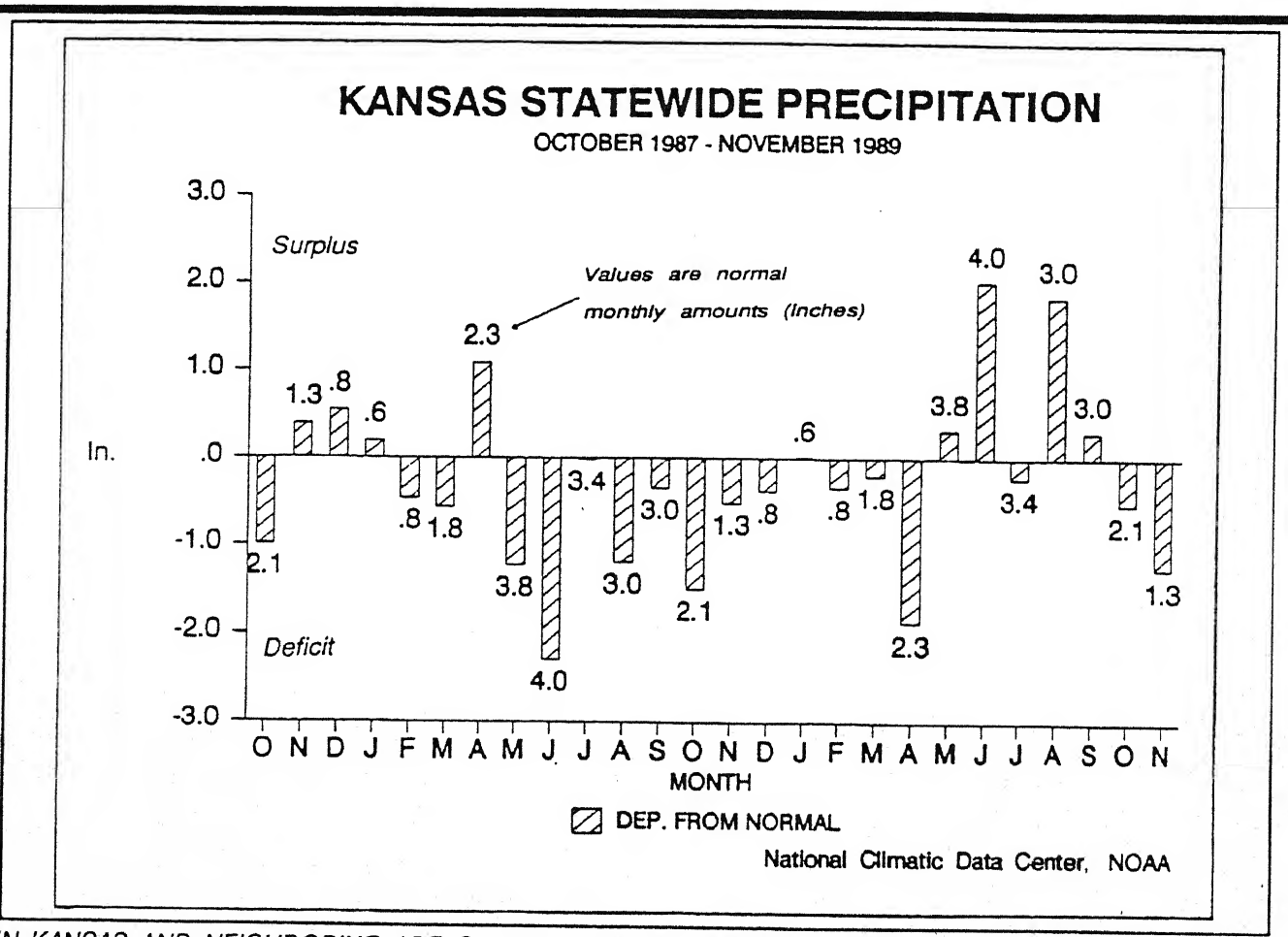
CLIMATE ANALYSIS CENTER

CONTAINS:
AUTUMN '89
UNITED
STATES
CLIMATE
SUMMARY

WEEKLY CLIMATE BULLETIN

No. 89/49 Washington, DC December 9, 1989



IN KANSAS AND NEIGHBORING AREAS, HEAVY SUMMER RAINS PROVIDED A BREAK FROM EXTREMELY DRY CONDITIONS DURING MAY 1988 THROUGH APRIL 1989 WHEN SUBNORMAL PRECIPITATION WAS RECORDED IN EVERY MONTH EXCEPT JANUARY 1989. THE MOISTURE SURPLUS OF THOSE MONTHS, HOWEVER, HAS BEEN RECENTLY OFFSET BY BELOW NORMAL OCTOBER PRECIPITATION, RECORD NOVEMBER DRYNESS, AND LITTLE OR NO PRECIPITATION DURING THE FIRST NINE DAYS OF DECEMBER AS TOPSOIL MOISTURE REMAINED SHORT AND SUBSOIL MOISTURE LEVELS DIMINISHED.

UNITED STATES DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL WEATHER SERVICE – NATIONAL METEOROLOGICAL CENTER

CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- Highlights of major climatic events and anomalies.
- U.S. climatic conditions for the previous week.
- U.S. apparent temperatures (summer) or wind chill (winter).
- U.S. cooling degree days (summer) or heating degree days (winter).
- Global two-week temperature anomalies.
- Global four-week precipitation anomalies.
- Global monthly temperature and precipitation anomalies.
- Global three-month precipitation anomalies (once a month).
- Global twelve-month precipitation anomalies (every three months).
- Global three-month temperature anomalies for winter and summer seasons.
- Special climate summaries, explanations, etc. (as appropriate).

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

STAFF

Editor	David Miskus
Associate Editor	Jeffrey D. Logan
Contributors	Vernon L. Patterson
	Monica L. Pogue
	Paul Sabol
	Richard J. Tinker
Graphics	Robert H. Churchill

*To receive copies of the **Bulletin** or to change mailing address, write to:*

Climate Analysis Center, W/NMC53

Attn: WEEKLY CLIMATE BULLETIN

NOAA, National Weather Service

Washington, DC 20233

For CHANGE OF ADDRESS, please include a copy of your old mailing label.

Phone: (301) 763-8071

WEEKLY CLIMATE BULLETIN REQUEST

☐ **Please ADD my address to your mailing list.**

☐ **Please CHANGE my address on your mailing list.**

☐ **Please DROP my address from your mailing list.**

Name _____

Organization _____

Address _____

City _____ State _____ Zip _____

GLOBAL CLIMATE HIGHLIGHTS

MAJOR EVENTS AND ANOMALIES AS OF DECEMBER 9, 1989

1. Northern and Eastern Canada and New England:

COLD AIR MASS STAGNATES.

Clear nighttime skies and the presence of snow cover dampened temperatures which averaged as much as 10°C below normal. For the month to date, Portland, ME has set new record low temperatures on three occasions [6 weeks].

2. Central Great Plains and Western Corn Belt:

MOST LOCATIONS REMAIN DRY.

Short-term moisture shortages spread northeastward into Iowa and Illinois where little to no precipitation was observed. While much of Missouri and Kansas were also dry, scattered areas of southern Kansas and Oklahoma noted totals in excess of 50 mm, the most that has fallen in these areas in more than three months [12 weeks].

3. West-Central Mexico:

UNSEASONAL RAINFALL NOTED.

While totals were not excessive, the 20 to 85 mm that fell from Mazatlan to Mexico City was quite exceptional since normal amounts for this period are less than 2.5 mm. With just over 85 mm recorded at Guadalajara, the first nine days of the month have produced the second wettest December on record. The largest amount occurred in Dec. 1963 when 89 mm fell [Episodic Event].

4. Spain:

PRECIPITATION REMAINS BOUNTIFUL.

Rainfall amounts of as much as 196 mm continued to create flooding conditions in southern and eastern portions of the country. For the past four weeks, accumulations range from 300% to 970% of normal [5 weeks]. Also, mild temperatures lingered with departures approaching +5°C [8 weeks].

5. Europe, Western U.S.S.R., and the Middle East:

SUBNORMAL TEMPERATURES PERSIST.

Cold conditions persisted across a large part of the continent with temperatures averaging nearly 9°C below normal. Little thermal variation has been noted as three-week departures approached -9°C [3 weeks].

6. South Africa:

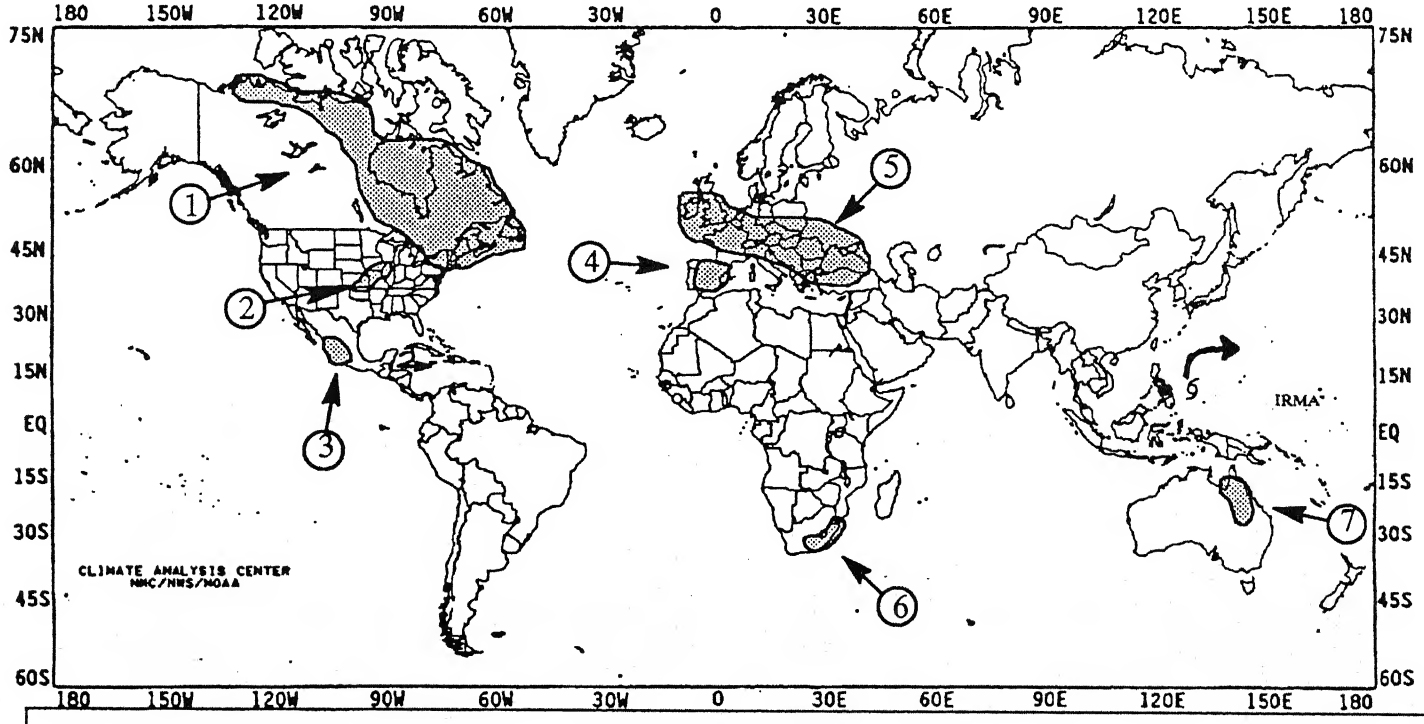
EXCESSIVE RAINS DIMINISH.

While a few coastal locations observed nearly 88 mm, totals elsewhere eased greatly from previous weeks' accumulations [6 weeks].

7. Northeastern Australia:

REGION REMAINS WET.

Rainfall of as much as 57 mm kept portions of Queensland wet. Meanwhile, lesser amounts (< 10 mm) aided the removal of abundant moisture from the more northern regions of the state [6 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF DECEMBER 3 THROUGH DECEMBER 9, 1989.

The first full week of meteorological winter brought a second consecutive week of exceedingly cold weather to the Northeast and a continuation of dry and mild weather across the western Plains. Early in the week, a strong low pressure center blanketed parts of northern New England with up to 14 inches of snow. As the storm quickly moved out to sea, a bitterly cold high pressure system pushed into the eastern U.S. from Canada. The cold air set more than a dozen daily minimum temperature records throughout the eastern third of the nation and generated another period of heavy lake-effect snows across the Great Lakes and Appalachian snowbelt regions. Some parts of the snowbelt were buried under one and a half feet of snow before a developing storm in the Southeast shifted the winds and ended the snow.

The winter storm began developing in the southern Rockies around midweek, bringing light to moderate rain and snow to portions of the eastern Rockies and the southern half of the High Plains. The system weakened somewhat as it moved southeastward, generating only scattered light rain across southern portions of the parched Plains, but rapidly reintensified upon moving to the northern Gulf Coast where the boundary between cold high pressure in the East and warm Gulf waters provided an ideal environment for development.

The center of the storm moved from approximately New Orleans, LA to the southern Atlantic Coast on Friday, then reorganized off the coast Friday night before slowly moving out to sea on Saturday. Three to six inches of snow blanketed most of the mid-Atlantic on Friday, although a small band across central Virginia and Maryland received six to twelve inches. In addition, minor river flooding was reported as heavy showers and thunderstorms swept across the Southeast. Sandwiched between the snow and the rain, mixed precipitation affected a large area from Arkansas to southern Virginia. Parts of northern North Carolina and southern Virginia became glazed with a heavy accumulation of ice. Several deaths were reported due to motor vehicle accidents, and downed trees and power lines became commonplace across the region as freezing rain continued for nearly 24 hours in some areas.

Farther west, a Pacific storm moved into Canada near midweek, dragging a cold front through northern portions of the Pacific Northwest, Intermountain West, and Rockies. Heavy rain fell along the immediate coasts of Washington and Oregon, with light to moderate rain or snow falling further inland. In Alaska, unseasonably mild and wet weather was reported statewide. Warm and dry conditions persisted across the eastern Hawaiian Islands while a slightly cooler and wetter pattern developed across the remainder of the state.

Widespread heavy precipitation, in excess of two inches, was confined to a band from the northern Gulf Coast to the middle Atlantic Coast, in the Pacific Northwest, central Hawaii, and along parts of the southern Alaska Coast (see Table 1). More than four inches of rain or mixed precipitation was reported at scattered locations in the Southeast and extreme eastern Washington.

Much of the light to moderate precipitation that fell was significant since it occurred in a freezing or frozen form. Moderate to heavy amounts of sleet, freezing rain, and snow were observed from the lower Mississippi Valley to the mid-Atlantic Coast, across the northeastern halves of the Great Lakes and the Northeast, and in the northern and central portions of the Rockies and High Plains. Many problems were caused by the snow and freezing rain in these areas even though precipitation totals were generally under an inch. South-central portions of the Intermountain West, High Plains, and Great Plains received similar amounts of precipitation, but most of it was in the form of rain.

The southwestern quarter of the nation, most of the northern half of the Plains, and the upper Midwest experienced little or no precipitation. The Great Plains have now endured nearly three months of exceptionally dry weather while the rain in the Southeast prolonged the abnormally wet conditions which have plagued the region for more than six months.

Bitterly cold air dominated the Northeast for the third consecutive week as temperatures averaged up to 18°F below normal (see Table 3). Subzero readings were common across parts of the upper Midwest and New England, and more than a dozen daily record lows were observed from the Northeast westward to the Great Lakes and southward to Florida during the week.

Elsewhere, the entire eastern half of the nation recorded below normal temperatures, with departures between -6°F and -10°F recorded across the mid-Atlantic, Ohio Valley, and Great Lakes. Slightly below normal temperatures were recorded throughout the rest of the East and in the western two-thirds of Hawaii.

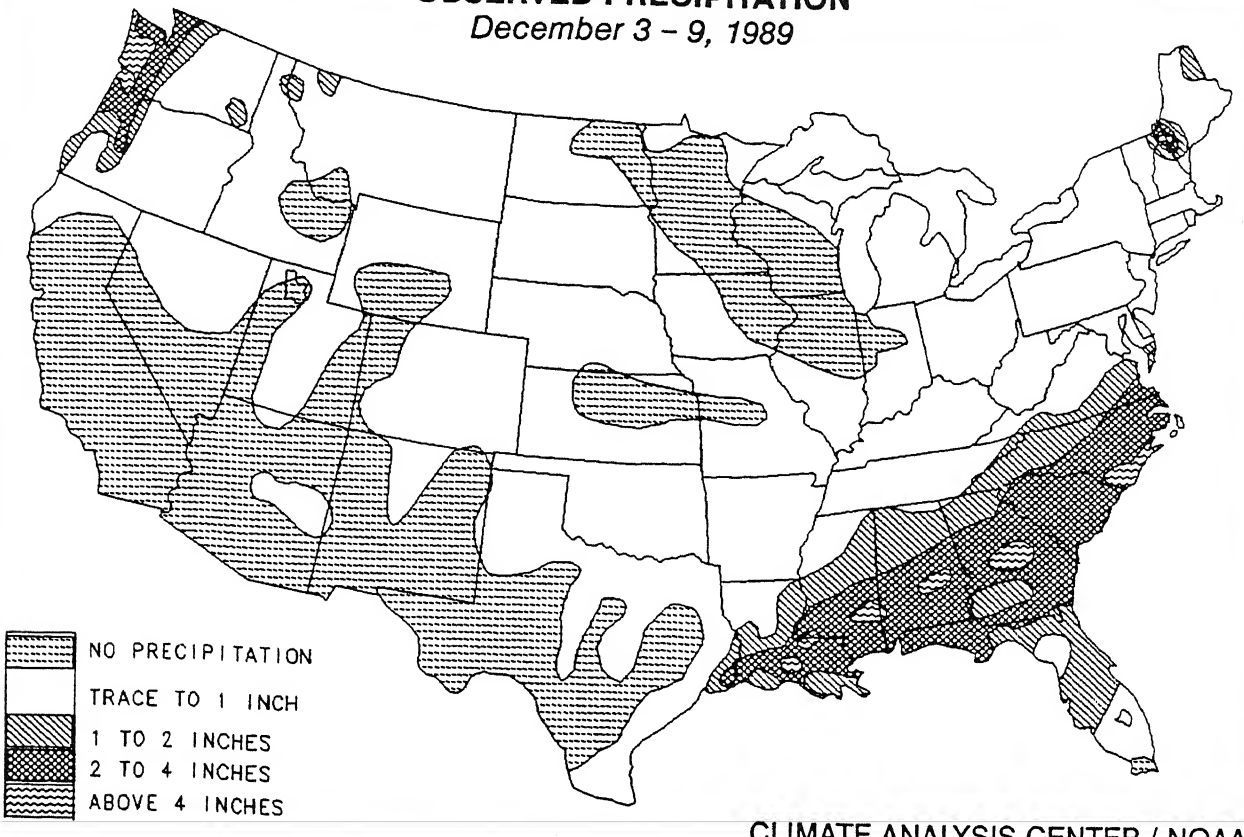
In contrast, warm weather dominated most of the western half of the nation except in Texas. The largest positive departures (between +10°F and +13°F) in the contiguous U.S. were reported in sections of the Intermountain West and across Montana (see Table 2). In addition, unseasonably mild weather replaced the Alaskan cold snap as some interior stations observed temperatures up to 18°F above normal. Well above normal readings presided over most of the Rockies, Great Basin, and Pacific Northwest with slightly milder than usual conditions observed across the remainder of the West.

TABLE 1. Selected stations with 3.00 or more inches of precipitation for the week.

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
QUILLAYUTE, WA	5.27	MACON/WARNER-ROBINS AFB, GA	3.54
ASTORIA, OR	5.04	COLUMBIA, SC	3.53
NEW ORLEANS/MOISANT, LA	4.94	CAPE HATTERAS, NC	3.52
WILMINGTON, NC	4.93	SAVANNAH/HUNTER AFB, GA	3.51
MACON, GA	4.61	TACOMA/MCCHORD AFB, WA	3.48
CHERRY POINT MCAS, NC	4.52	SALEM, OR	3.45
KODIAK, AK	4.21	NEW BERN, NC	3.31
MONTGOMERY/MAXWELL AFB, AL	4.11	TACOMA/FT.LEWIS/GRAY AAF, WA	3.30
LAFAYETTE, LA	4.08	MERIDIAN, MS	3.25
OLYMPIA, WA	3.82	FLORENCE, SC	3.15
MONTGOMERY, AL	3.79	JACKSONVILLE/NEW RIVER MCAS, NC	3.09
MCCOMB, MS	3.75	SEATTLE-TACOMA, WA	3.08
NEW ORLEANS NAS, LA	3.65	COLUMBUS, GA	3.04
APALACHICOLA, FL	3.59		

OBSERVED PRECIPITATION

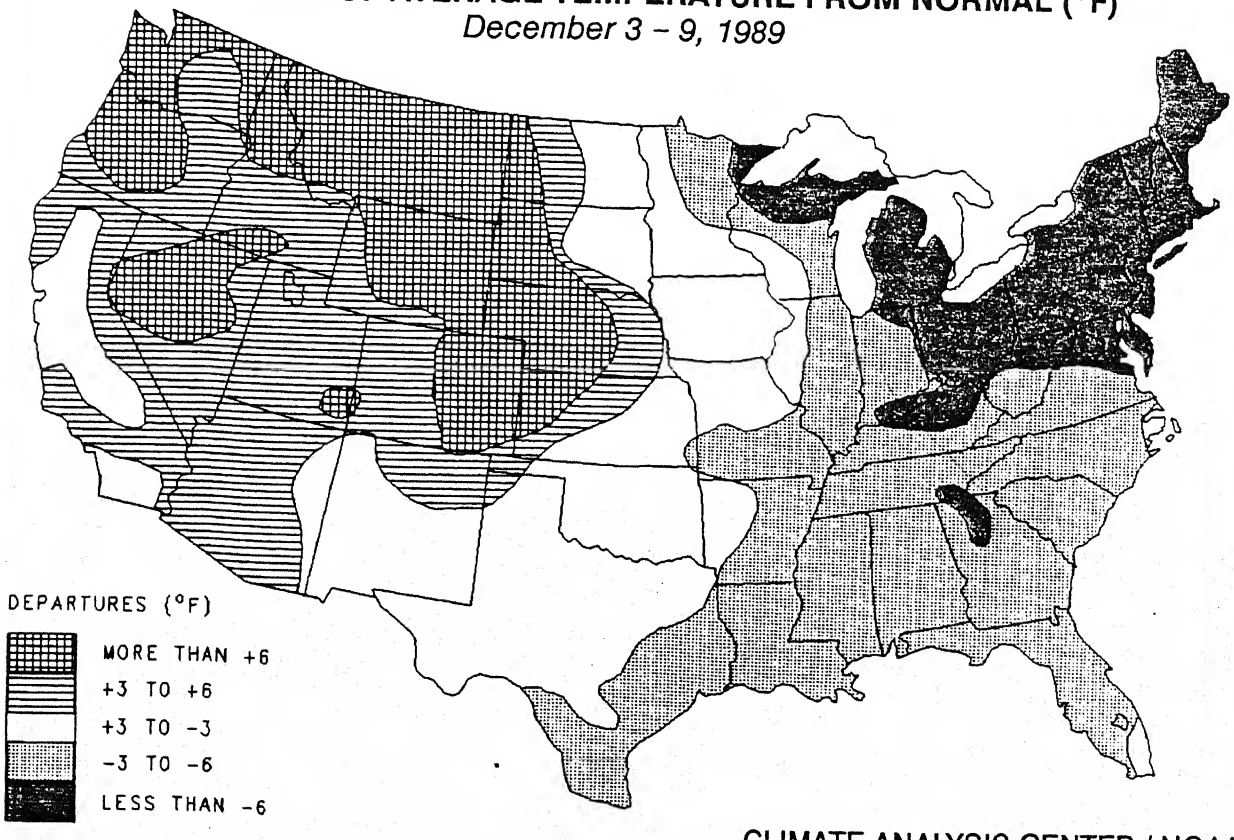
December 3 – 9, 1989



CLIMATE ANALYSIS CENTER / NOAA

DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

December 3 – 9, 1989



CLIMATE ANALYSIS CENTER / NOAA

TABLE 2. Selected stations with temperatures averaging 10.0°F or more ABOVE normal for the week.

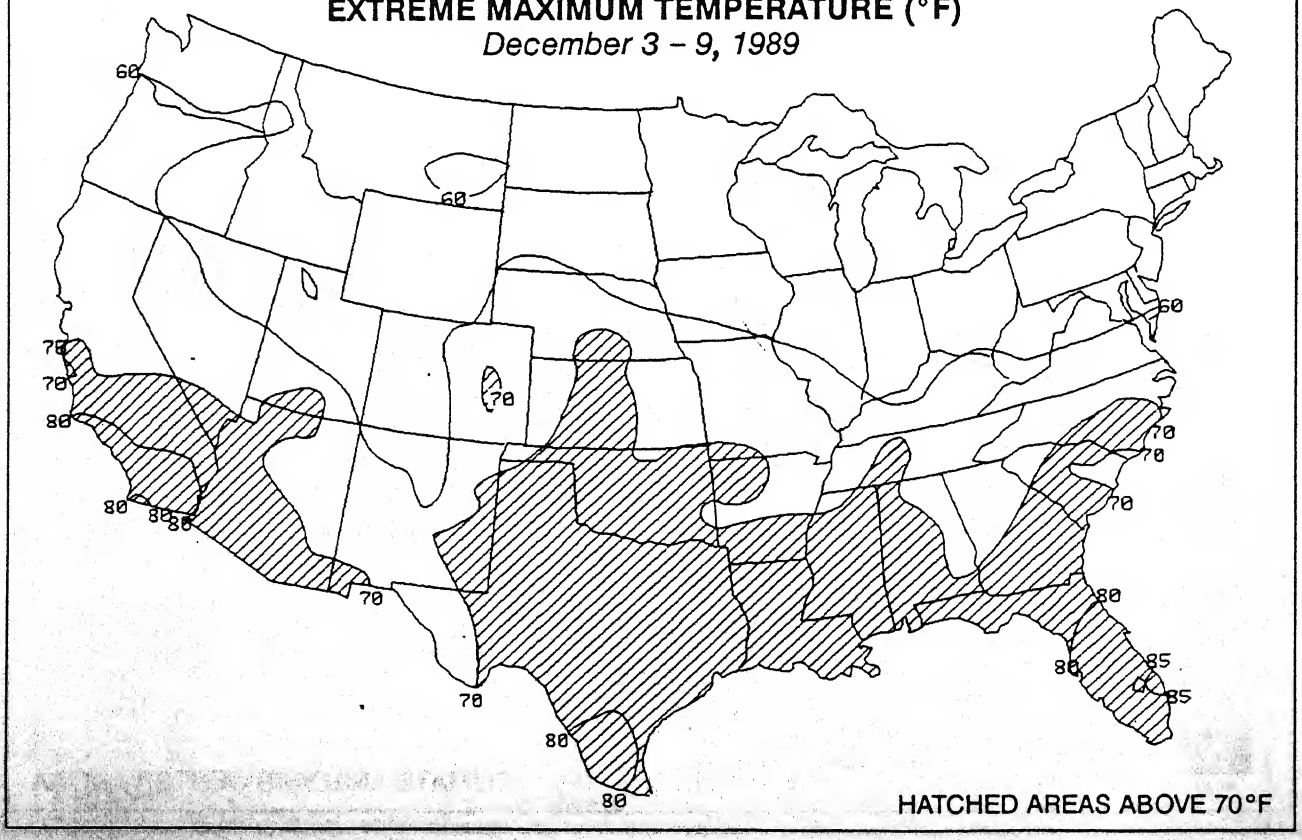
STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
FORT YUKON, AK	+20.5	3.9	ANIAK, AK	+11.6	14.3
BIG DELTA, AK	+18.2	16.3	HAVRE, MT	+11.5	34.5
UNALAKLEET, AK	+16.7	20.3	CUT BANK, MT	+11.1	34.8
KOTZEBUE, AK	+16.2	14.2	NORTHWAY, AK	+10.9	-2.8
ILIAMNA, AK	+15.6	30.9	TALKEETNA, AK	+10.8	21.4
BARTER ISLAND, AK	+15.0	4.9	LEWISTOWN, MT	+10.7	37.3
NOME, AK	+14.9	21.4	HOMER, AK	+10.3	33.9
KENAI, AK	+14.3	28.4	KING SALMON, AK	+10.3	24.5
FAIRBANKS, AK	+14.1	7.0	BLUE CANYON, CA	+10.2	50.9
MILES CITY, MT	+13.1	37.8	BILLINGS, MT	+10.2	40.2
BETTLES, AK	+12.3	5.9	HELENA, MT	+10.2	36.2
VALDEZ, AK	+12.1	32.7	CORDOVA/MILE 13, AK	+10.1	35.3
GLASGOW, MT	+11.9	32.6	REDMOND, OR	+10.0	44.3
GREAT FALLS, MT	+11.6	40.4			

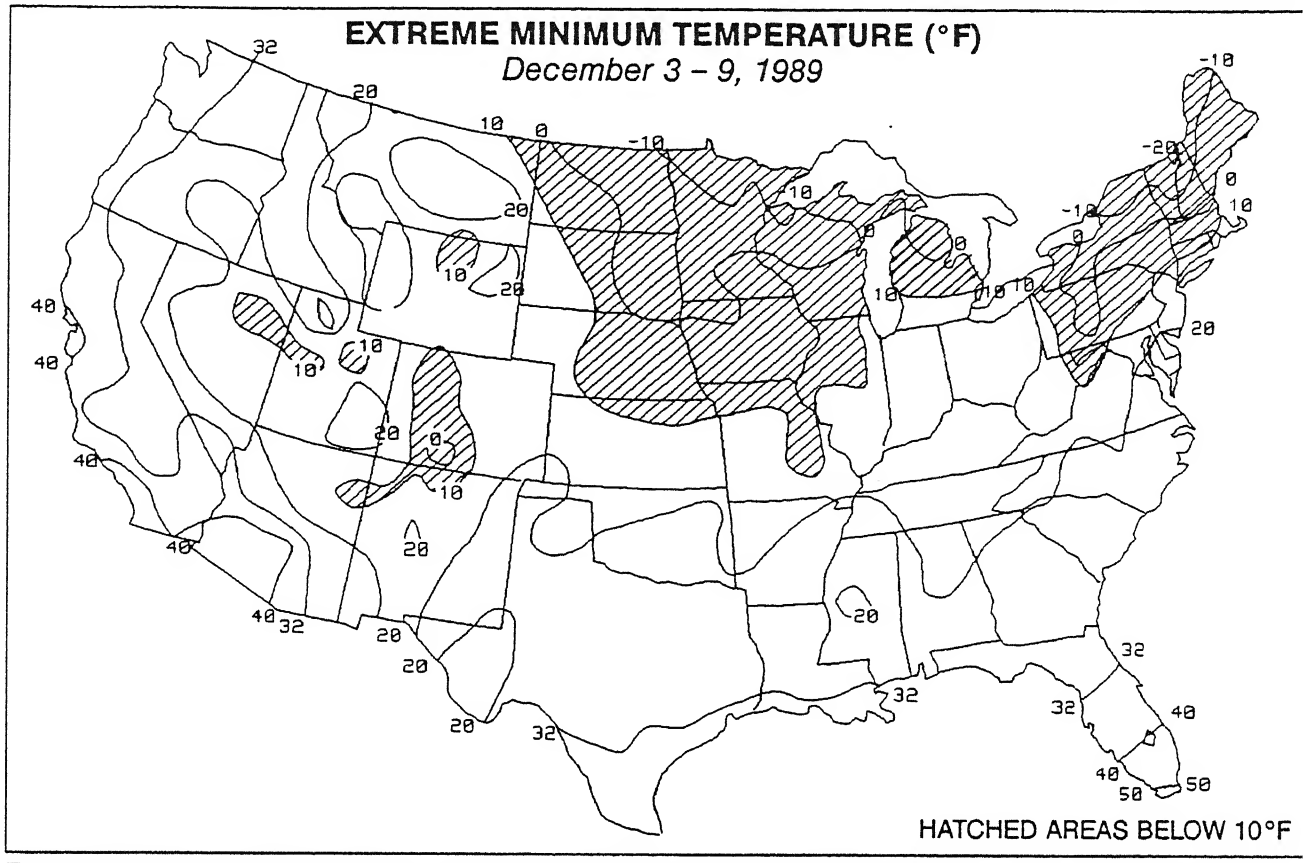
TABLE 3. Selected stations with temperatures averaging 12.0°F or more BELOW normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
MT. WASHINGTON, NH	-17.2	-5.2	HOULTON, ME	-13.3	7.6
MASSENA, NY	-17.0	7.1	BOSTON/LOGAN, MA	-13.3	23.1
LEBANON, NH	-16.8	9.1	ROCHESTER, NY	-13.2	19.0
MONTPELIER, VT	-16.6	7.6	BINGHAMTON, NY	-13.1	16.2
GLENS FALLS, NY	-16.4	11.4	ALPENA, MI	-12.9	14.4
BURLINGTON, VT	-15.8	10.7	PORTLAND, ME	-12.9	16.1
CONCORD, NH	-14.7	13.1	RUMFORD, ME	-12.7	11.9
UTICA, NY	-14.5	14.3	POUGHKEEPSIE, NY	-12.6	19.8
SYRACUSE, NY	-14.5	17.2	BUFFALO, NY	-12.5	19.7
ROME/GRIFFISS AFB, NY	-14.4	14.6	CARIBOU, ME	-12.3	7.4
AUGUSTA, ME	-13.8	13.6	BANGOR, ME	-12.1	14.4
WORCESTER, MA	-13.8	16.5	BRADFORD, PA	-12.0	15.7
ALBANY, NY	-13.6	16.3	BRIDGEPORT, CT	-12.0	25.0

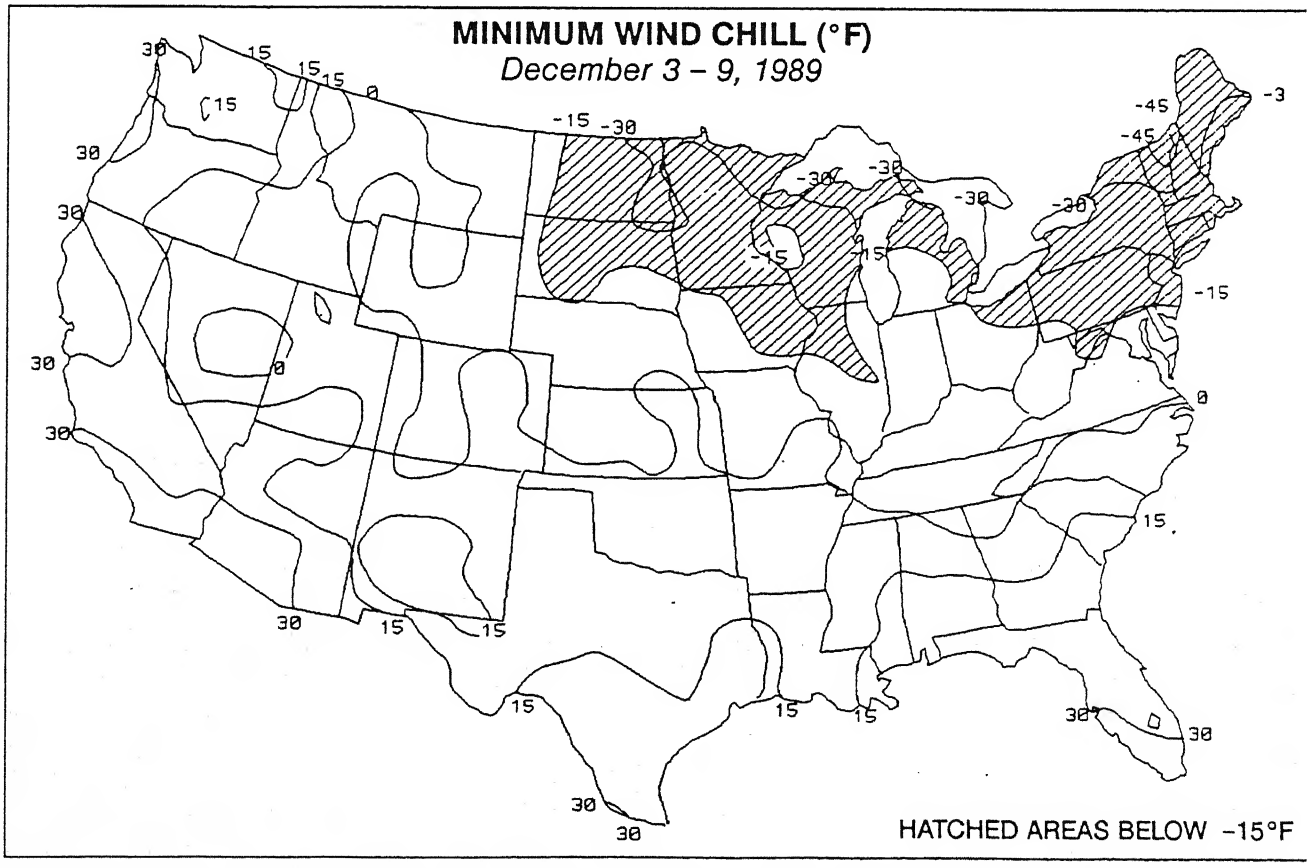
EXTREME MAXIMUM TEMPERATURE (°F)

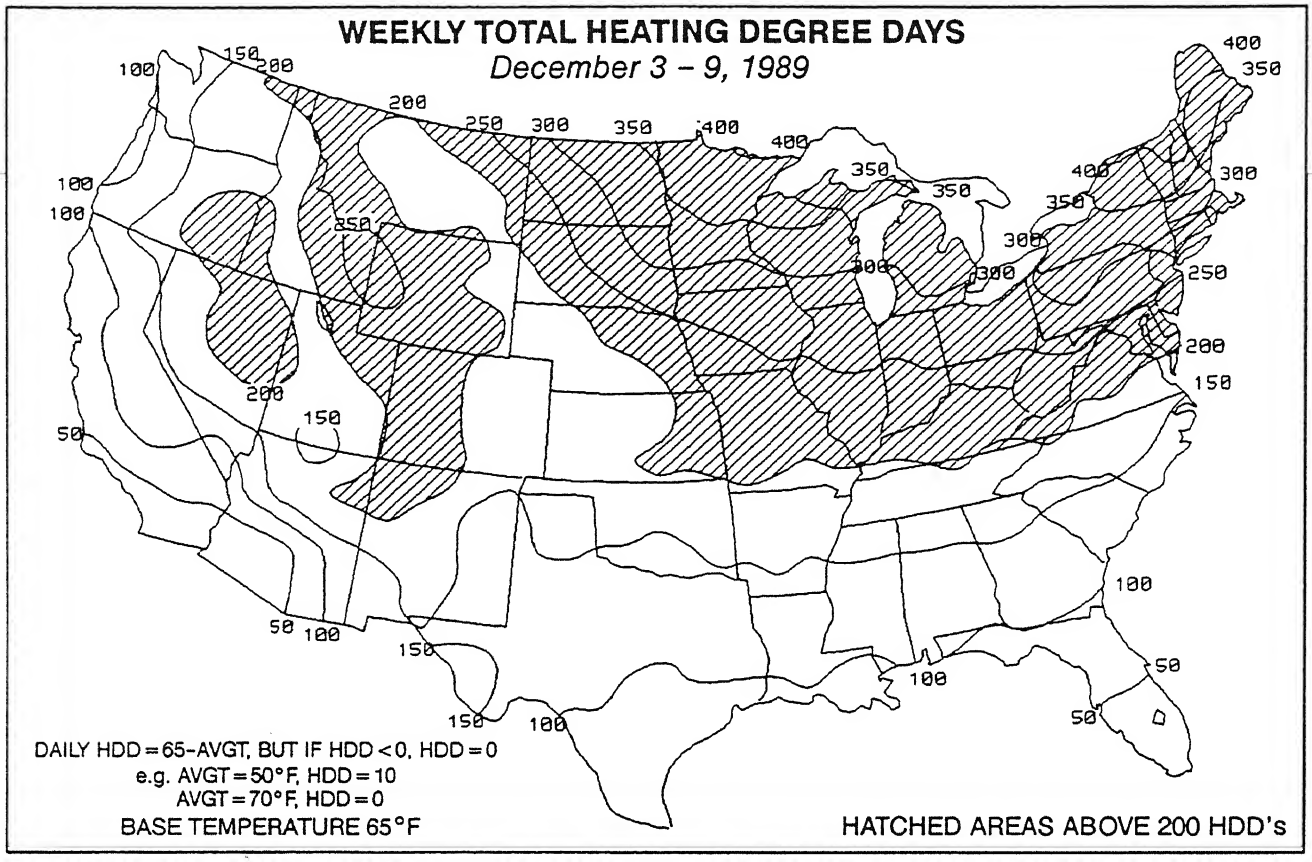
December 3 – 9, 1989



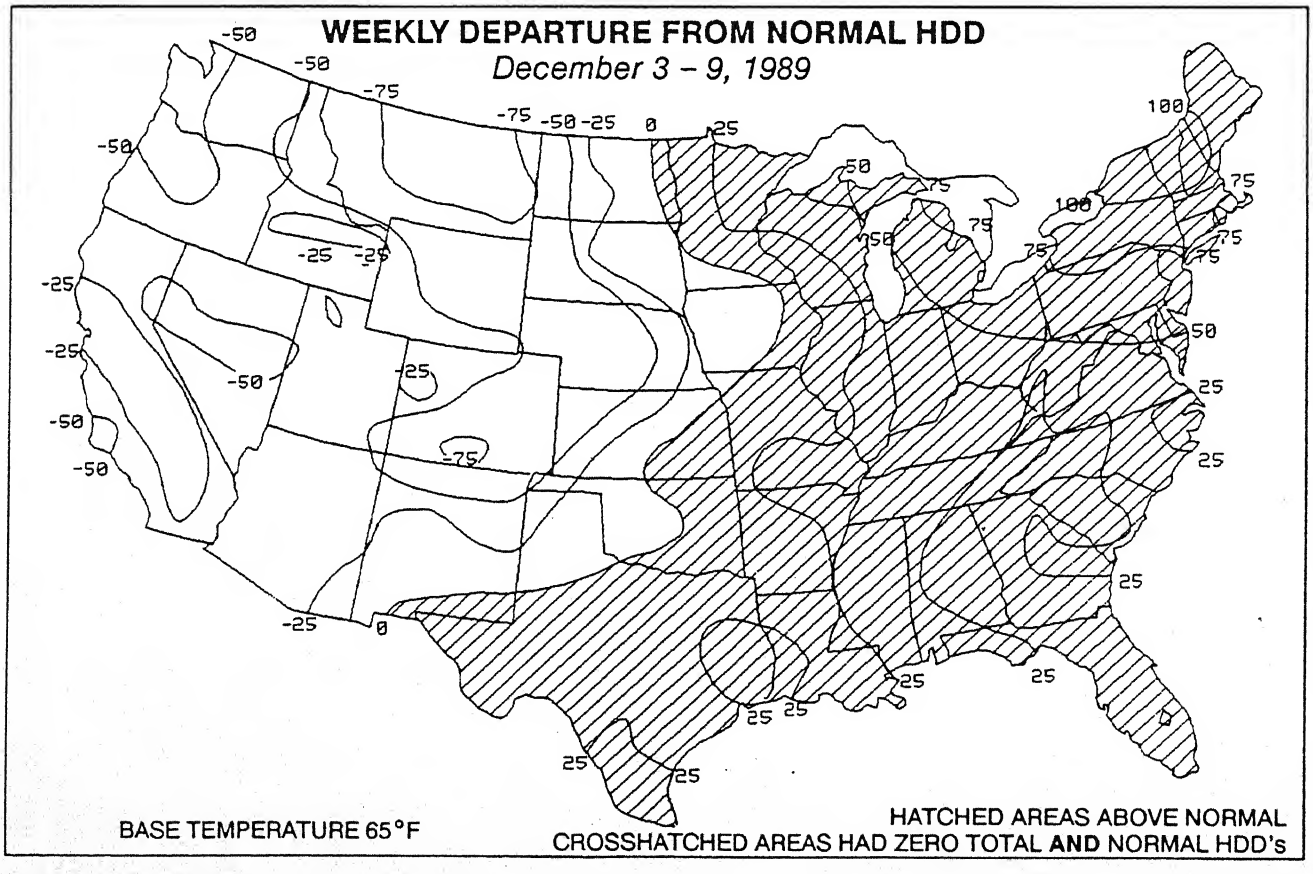


For the third consecutive week, bitterly cold Arctic air ushered in subzero readings across the northern Great Plains and uppe Midwest while frigid conditions dropped temperatures well below 0°F in New England for the second consecutive week (top). Dan gerous wind chills (less than -15°F) occurred across much of the northeastern quarter of the country as strong winds accompanie low temperatures (bottom).



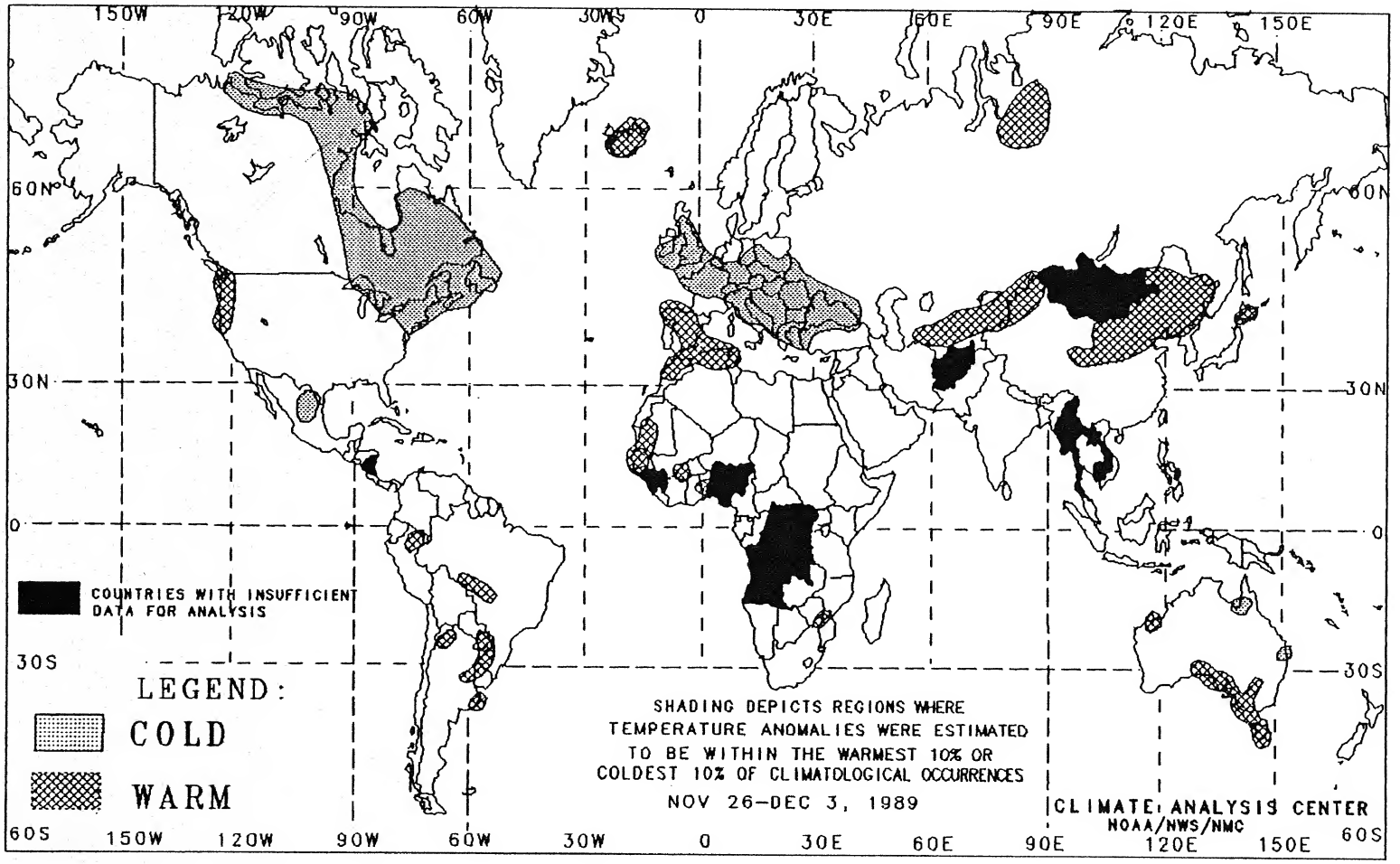


Frigid Arctic air covered the eastern half of the nation and pushed the weekly total heating consumption above 200 HDDs across the northeastern quarter of the U. S. In extreme northern Minnesota and northwestern New England, heating totals surpassed 400 HDDs (top). With cold air entrenched in the South and East, weekly heating demand was much above normal while unseasonably mild conditions in the Far West and Rockies reduced the usual weekly heating demand (bottom).



GLOBAL TEMPERATURE ANOMALIES

2 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

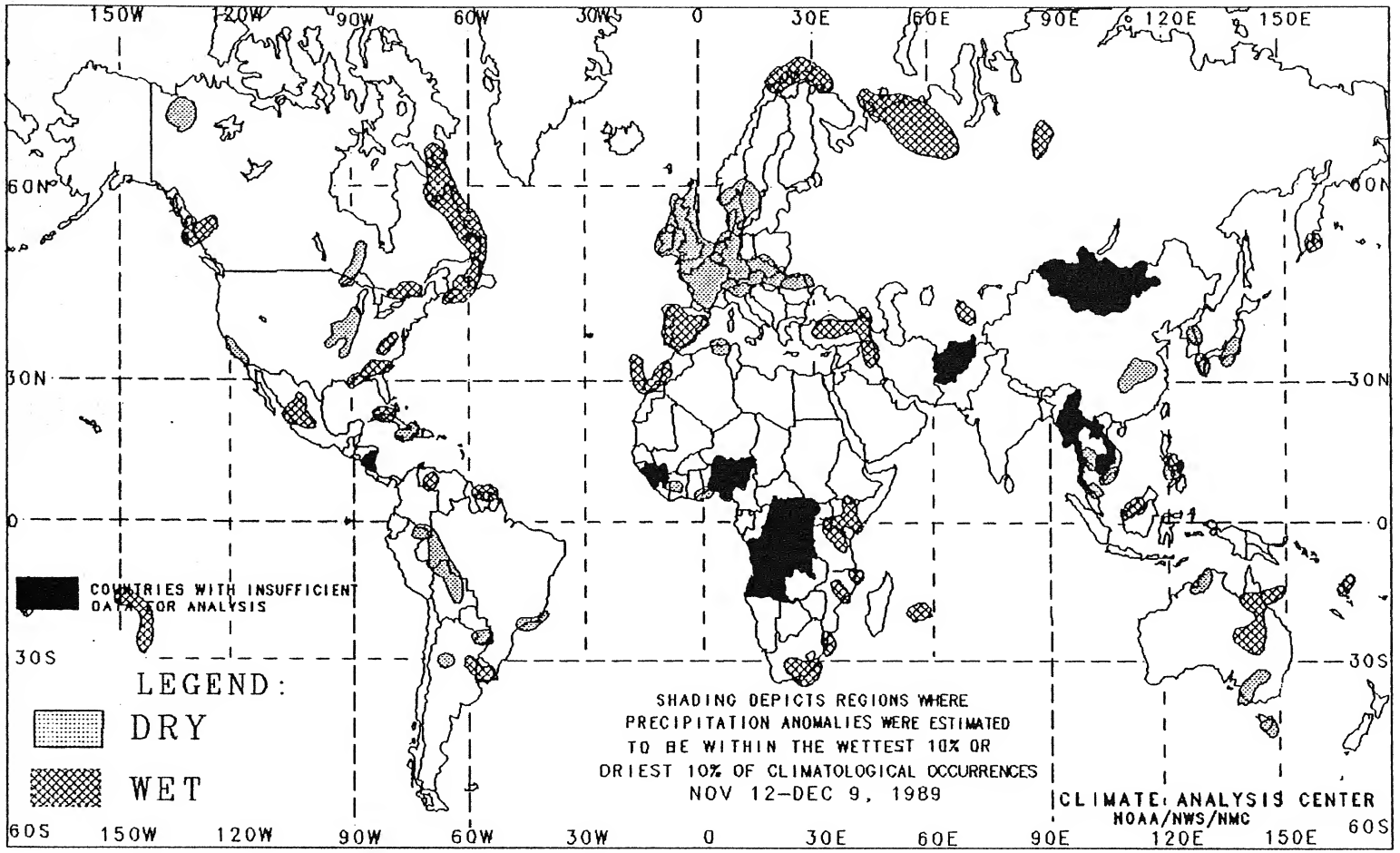
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

GLOBAL PRECIPITATION ANOMALIES

4 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

UNITED STATES SEASONAL CLIMATE SUMMARY

AUTUMN (SEPTEMBER-NOVEMBER) 1989

The distinguished feature of this Autumn was Hurricane Hugo, the strongest hurricane to hit the Atlantic Seaboard in at least 50 years. Hugo made landfall near Charleston, S.C. just before midnight, September 22 with maximum sustained winds of 135 mph. The hurricane then plowed across South Carolina during the early morning hours, reaching Charlotte, N.C. around 3 A.M. EDT, at which time it was downgraded to a tropical storm. Earlier in the week, Hugo had blasted through the Leeward Islands and eastern Puerto Rico, causing severe destruction and several deaths. Damage totals in the U.S. alone exceeded 5 billion dollars. Other tropical storms which directly or indirectly affected the U.S. included Hurricane Jerry which came ashore near Galveston, TX on Oct. 15 with maximum sustained winds of 85 mph; Pacific Hurricane Octave, whose remnants coupled with a cold front to produce rare September rains across northern and central California; and intense Hurricane Gabrielle, located in the open waters of the Atlantic near Bermuda, combined with a large high pressure center positioned over the Canadian Maritime provinces to create 5 to 10 foot swells along portions of the Atlantic Coast.

Similar to the transitional spring months, the autumn months were typified by temperature extremes. Numerous fast-moving weather systems kept the length of cold and warm episodes to a minimum as seasonal temperatures averaged near the long-term mean. Daily temperature departures, however, were of considerable magnitude as hundreds of daily maximum and minimum temperature records were broken while dozens of stations set new monthly extreme temperature records during September-November. The sharp contrast in temperatures also produced severe weather and an above normal autumn tornado season (see Figures 7 and 8). In mid-November, twisters caused several deaths and extensive property damage in Huntsville, AL while a tornado in Newburgh, NY collapsed a school cafeteria wall onto many students.

Even with an active 1989 tropical season and frequent frontal passages, the lower 48 states experienced slightly drier than normal autumn conditions, a departure from the trend of abnormally wet autumns observed nationally since 1981 with the exception of Fall 1987 (see page 11). Much of the nation recorded ample September precipitation, but pockets of extreme dryness occurred in the upper Great Lakes, Pacific Northwest, Southwest, and southern Great Plains. During October, much drier weather prevailed across the country except along the East Coast and in the northern Rockies and High Plains. An early-season snow storm blanketed portions of the lower Midwest with up to 9 inches during the third week of the month. Dryness intensified during November with no measurable precipitation reported across much of the central Plains as the contiguous U.S. recorded the ninth driest November since 1895. Farther east, however, heavy rains inundated the central Gulf Coast, and many cities from Washington, D.C. to Boston, MA observed the snowiest Thanksgiving on record. Heavy lake-effect snows buried parts of the Great Lakes and Appalachian snowbelt regions.

According to the River Forecast Centers, the largest seasonal totals (between 20 and 26 inches) were found along the central Gulf and northwestern Washington Coasts, in the eastern Tennessee Valley, southern Appalachians and Piedmont, and in parts of the northern Appalachians and coastal New England. Locally, Cape Hatteras, NC measured over 33 inches, nearly two-thirds of the normal ANNUAL amount, while sections of the south- central and southeastern Alaskan coast reported copious precipitation. The pattern of above normal precipitation that commenced during the late Spring continued in the South and East (see Table 1, Figures 1 and 2). Surplus autumn precipitation also fell from northern California northeastward to western Montana, across the northern Cascades, the north-central Plains, and in parts of the central Great Plains, the latter area receiving the bulk of its precipitation during September.

In sharp contrast, subnormal September-November precipitation occurred across much of the country west of the Mississippi River and in Florida. Less than half the normal seasonal precipitation fell from Missouri southward to western Louisiana and westward into central Texas, throughout the Southwest, and over parts of the central High Plains and southern Rockies (see Table 2, Figures 1 and 2). Nationally, the Fall of 1989 was ranked as the 28th driest autumn since 1895 (see page 10), and every region except the Northeast and Southeast were relatively dry, most notably the Southwest (4th driest on record). Six states (AZ, CO, MO, OR, TX, and UT) observed an exceptionally dry autumn (see page 10). Although dryness along the West Coast has not been extreme this Fall, 1989 marked the third and fourth consecutive years that subnormal Sep.-Nov. precipitation was reported in the Northwest and West regions, respectively (see Figures 5 and 6).

With national temperatures averaging near the long-term mean (see page 11), statistically significant above normal temperatures (percentiles>70%) were confined to the desert Southwest, the Pacific Northwest, and the northern Rockies (see Figure 3). Much of the western half of the U.S., parts of the South, and most of the Atlantic Coast states recorded slightly milder than usual autumn conditions, but departures were generally within 2°F of normal (see Table 3, Figure 4).

Colder than normal fall weather was observed in the upper Midwest, the Ohio and the middle Mississippi Valleys, across the Great Lakes, along the Gulf Coast, in the central Great Plains, and in northern California and the Great Basin, but departures generally deviated no more than 3°F from the long-term mean (see Table 4, Figures 3 and 4). In Alaska, a milder than usual September and early October were negated by frigid Arctic air from late October to late November as readings plunged under -50°F at several locations and seasonal temperatures averaged 1°F to 2°F below normal throughout much of the state.

TEMPERATURE AND PRECIPITATION RANKINGS FOR AUTUMN 1989, BASED ON THE PERIOD 1895 - 1989 (95 YEARS) WHERE 1 = DRIEST/COLDEST AND 95 = WETTEST/HOTTEST

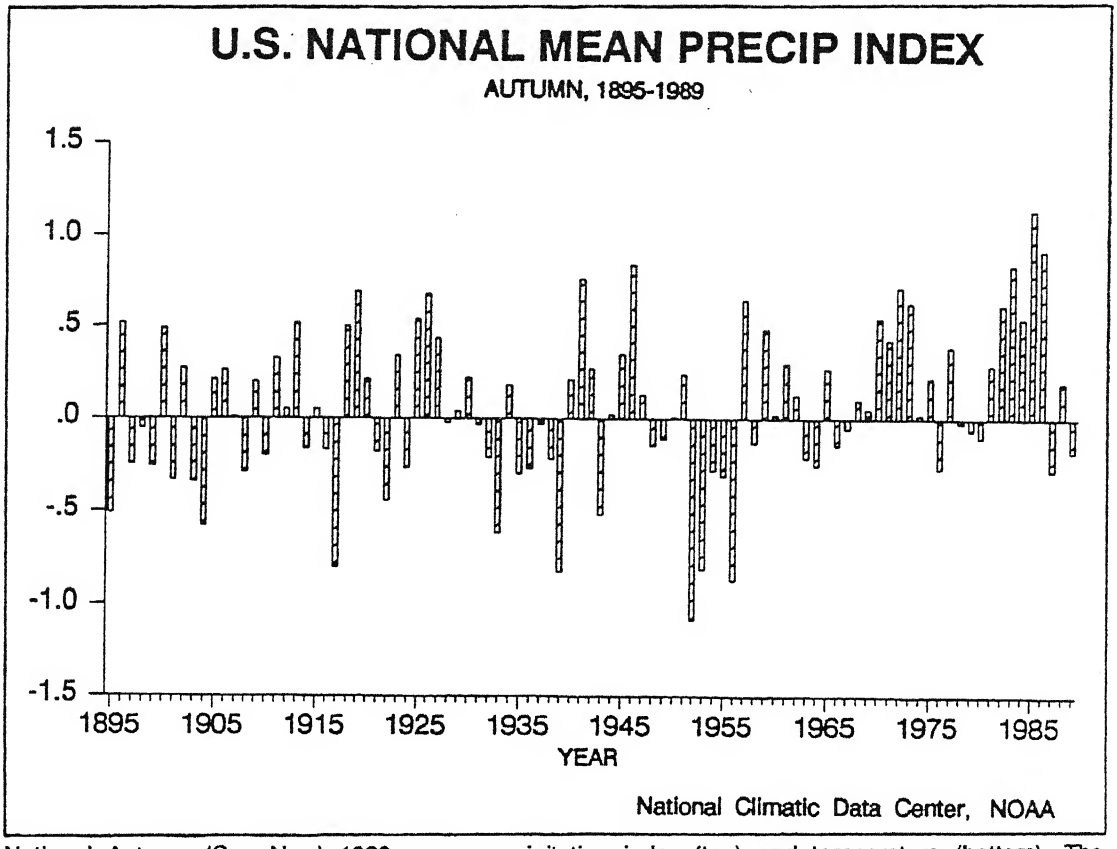
REGION	*PRECIPITATION*	*TEMPERATURE*
NORTHEAST	77	39
EAST NORTH CENTRAL	25	20
CENTRAL	42	32
SOUTHEAST	78	47
WEST NORTH CENTRAL	39	63
SOUTH	22	36
SOUTHWEST	4	80
NORTHWEST	26	66
WEST	33	58
NATIONAL	26	55

National Climatic Data Center

PRECIPITATION RANKINGS FOR AUTUMN 1989, BASED ON THE PERIOD 1895 - 1989 (95 YEARS) WHERE 1 = DRIEST AND 95 = WETTEST

STATE	*RANK*	*STATE*	*RANK*	*STATE*	*RANK*	*STATE*	*RANK*
AL	85	IA	37	NE	36	RI	63
AZ	12	KS	27	NV	38	SC	83
AR	7	KY	76	NH	59	SD	73
CA	37	LA	41	NJ	83	TN	78
CO	5	ME	41	NM	14	TX	4
CT	83	MD	71	NY	85	UT	7
DE	74	MA	58	NC	84	VT	73
FL	34	MI	30	ND	24	VA	80
GA	69	MN	24	OH	56	WA	29
ID	43	MS	74	OK	35	WV	81
IL	39	MO	5	OR	10	WI	16
IN	63	MT	33	PA	67	WY	52

National Climatic Data Center



U.S. National Autumn (Sep.-Nov.) 1989 mean precipitation index (top) and temperature (bottom). The Autumn precipitation for each climate division in the country (total of 344) was first standardized over the 1951-1980 period, then weighed by area and averaged to determine a national standardized precipitation value. Negative (positive) values are dry (wet). Based upon the index, the Autumn 1989 precipitation was slightly below the long-term mean (the 28th driest Sep.-Nov. during the past 95 years). Fall 1989 temperatures across the contiguous U.S. averaged near the long-term mean, ranking as the 41st warmest Sep.-Nov. on record (since 1895). The 1989 value is based upon preliminary data which has a standard error of estimate of 0.26°F, indicated in the figure as '+'.

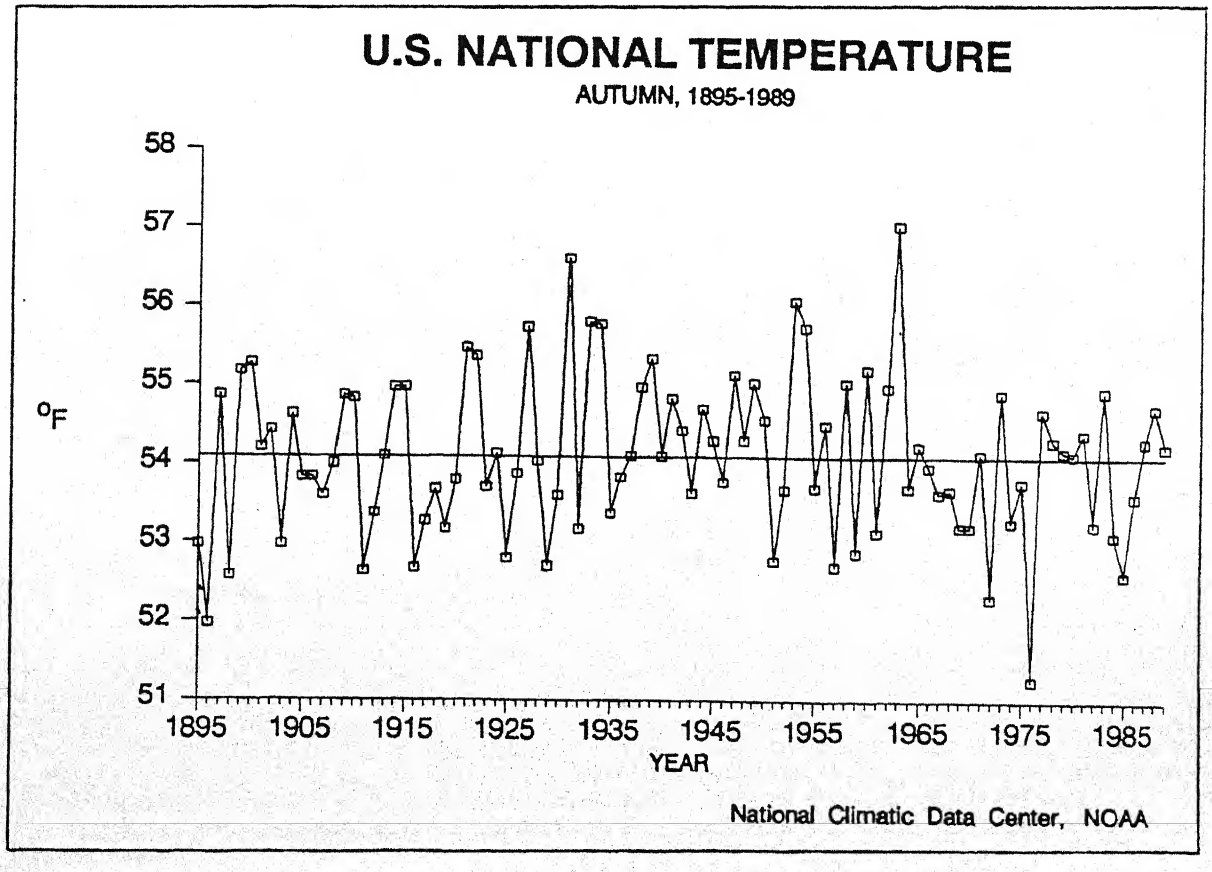


TABLE 1. SELECTED STATIONS WITH MORE THAN 150% OF NORMAL PRECIPITATION AND MORE THAN 15 INCHES OF PRECIPITATION; OR, STATIONS WITH MORE THAN 15 INCHES OF PRECIPITATION AND NO NORMALS DURING AUTUMN 1989.

STATION	TOTAL (INCHES)	PCT. OF NORMAL	STATION	TOTAL (INCHES)	PCT. OF NORMAL
VALDEZ, AK	33.70	161.6	MILTON/WHITING NAS, FL	17.81	***
CAPE HATTERAS, NC	33.48	217.0	PROVIDENCE, RI	17.48	152.8
NEW ORLEANS NAS, LA	25.65	***	ATLANTA, GA	17.32	191.2
NEW ORLEANS/MOISANT, LA	24.87	198.6	CAPE CANAVERAL AFS, FL	17.27	***
VALPARAISO/EGLIN AFB, FL	20.80	159.6	ROANOKE, VA	16.93	185.2
BATON ROUGE, LA	20.24	184.0	LONDON/CORBIN, KY	16.72	***
ATHENS, GA	19.66	206.1	CHICOPEE/WESTOVER AFB, MA	16.47	155.4
CHARLESTON, SC	19.28	193.0	ROME/GRIFFISS AFB, NY	16.25	162.8
JACKSON, KY	19.01	226.6	MERIDIAN, MS	15.75	163.2
ISLIP, NY	18.68	167.4	OZARK/CAIRNS AFB, AL	15.68	***
CHATTANOOGA, TN	18.44	161.6	KNOXVILLE, TN	15.54	164.6
MYRTLE BEACH AFB, SC	18.31	***	ASHEVILLE, NC	15.46	154.4
DOTHAN, AL	17.92	***	LYNCHBURG, VA	15.01	157.8

(Note: Stations without precipitation normals are indicated by asterisks.)

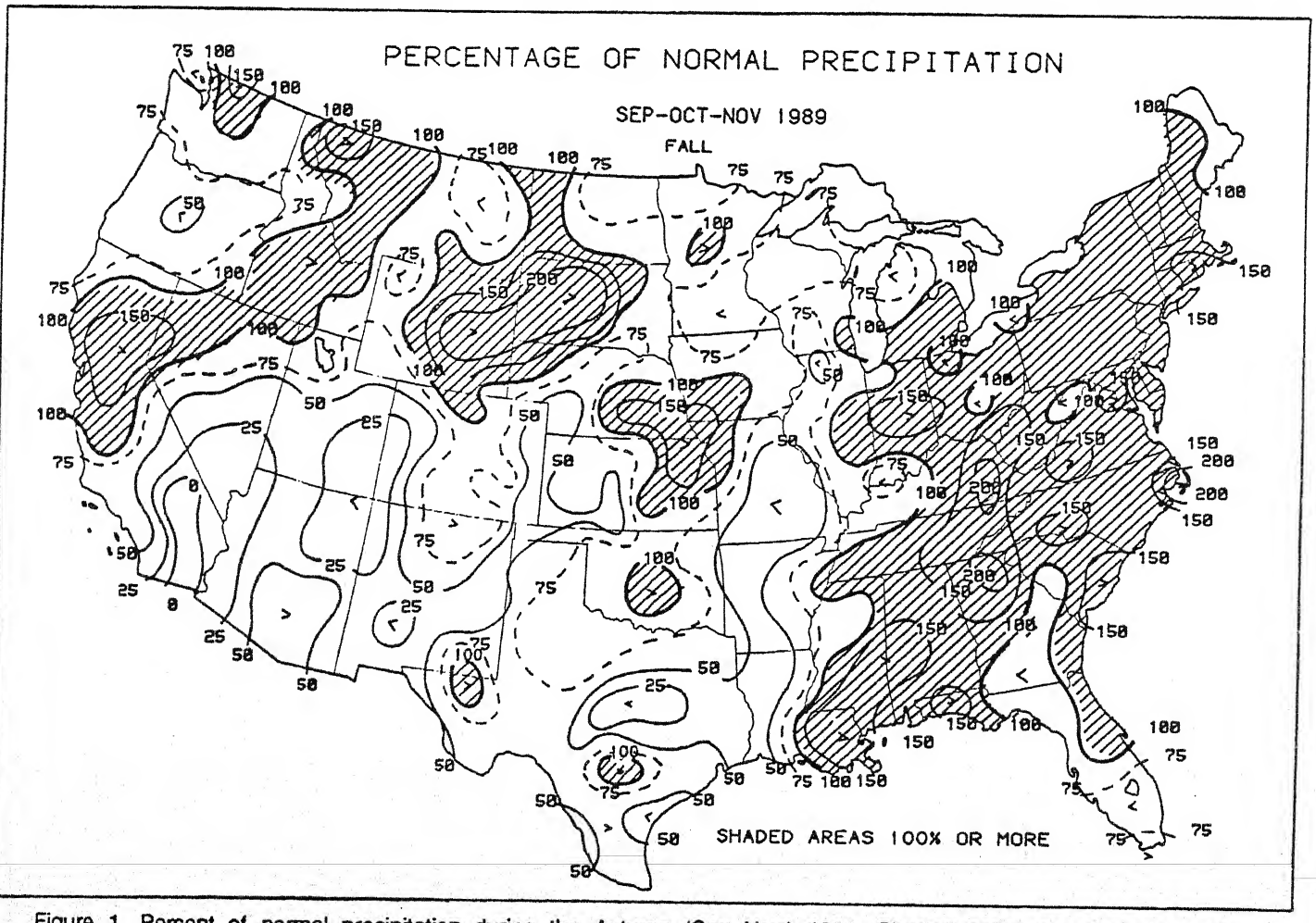


Figure 1. Percent of normal precipitation during the Autumn (Sep.-Nov.) 1989. Shaded areas are above normal. Surplus autumn precipitation fell on much of the eastern third of the nation, continuing a wet weather pattern since the late spring. Generous precipitation also occurred in the northern portions of California, the Great Basin, the Rockies, and the Plains. In sharp contrast, extremely dry conditions, especially during November, were recorded in the Southwest, the southern Rockies, and throughout much of the central one-third of the country.

TABLE 2. SELECTED STATIONS WITH LESS THAN 50% OF NORMAL PRECIPITATION AND NORMAL PRECIPITATION 7.00 INCHES OR MORE DURING AUTUMN 1989.

TATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)	STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)
KENAI, AK	0.58	7.9	7.30	BEEVILLE NAS, TX	3.74	45.2	8.28
WACO, TX	1.50	17.8	8.43	HANCOCK, MI	3.75	42.5	8.82
MCALLEN, TX	2.04	23.6	8.64	PARK FALLS, WI	3.87	48.4	8.00
POPLAR BLUFF, MO	2.34	22.2	10.55	DALLAS/LOVE FIELD, TX	3.91	41.9	9.33
HARRISON, AR	2.63	26.6	9.88	KINGSVILLE NAS, TX	3.96	49.9	7.93
ROLLA, MO	2.76	31.5	8.76	EL DORADO, AR	3.97	38.0	10.44
ALEXANDRIA/ENGLAND, LA	3.00	29.8	10.06	CORPUS CHRISTI, TX	3.99	37.1	10.77
ST. LOUIS, MO	3.23	43.1	7.49	FAYETTEVILLE, AR	4.06	37.2	10.91
TEXARKANA, AR	3.25	31.9	10.19	MONROE, LA	4.30	43.5	9.88
AUSTIN/BERGSTROM, TX	3.32	37.7	8.80	COLLEGE STATION, TX	4.33	37.1	11.68
WEST PLAINS, MO	3.39	33.3	10.19	LUFKIN, TX	4.46	43.3	10.29
COLUMBIA, MO	3.42	36.6	9.34	FORT SMITH, AR	4.90	49.4	9.91
LONGVIEW/GREGG CO., TX	3.47	30.6	11.35	PALACIOS, TX	4.97	35.3	14.09
EAU CLAIRE, WI	3.49	49.9	7.00	LAKE CHARLES, LA	5.11	37.7	13.57
ROCKFORD, IL	3.66	41.3	8.86	PORT ARTHUR, TX	5.51	41.4	13.31
SPRINGFIELD, MO	3.71	35.9	10.34	HOUSTON, TX	6.28	50.0	12.56
ALICE, TX	3.73	33.7	11.08	KETCHIKAN, AK	22.13	40.1	55.16
AUSTIN, TX	3.73	40.9	9.11				

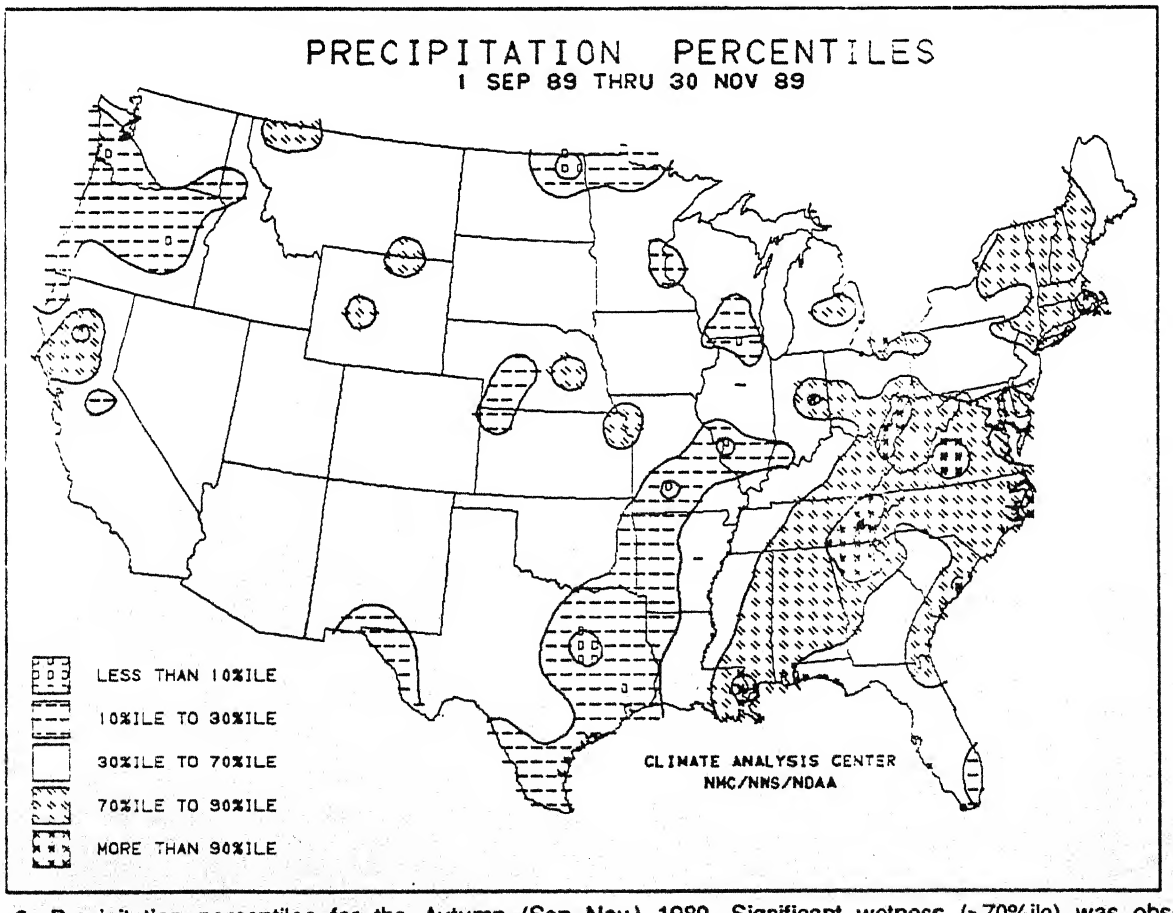


Figure 2. Precipitation percentiles for the Autumn (Sep.-Nov.) 1989. Significant wetness (>70%ile) was observed from the central Gulf Coast northeastward into the mid-Atlantic and central Appalachians, in most of New England, and in sections of northern California, the northern Rockies, and the south-central Missouri Valley. Substantially dry conditions (<30%ile) in non-arid areas (3-month normal precipitation>60 mm) were found in the southeastern Great Plains northeastward into the middle Mississippi Valley, in parts of the upper Midwest, southern Florida, and in much of the Pacific Northwest. Most locations in Alaska and Hawaii generally measured near normal seasonal precipitation; however, the precipitation was unevenly distributed in the eastern Hawaiian Islands. For example, record November dryness at Hilo (Obs=1.02" vs. Nml=14.86") was preceded by above normal September and October rainfall.

TABLE 3. AUTUMN 1989 AVERAGE TEMPERATURES 2.0°F OR MORE ABOVE NORMAL.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
PHOENIX, AZ	+5.0	77.9	TUCSON, AZ	+2.6	72.4
OMAK, WA	+4.4	51.7	CHARLESTON, SC	+2.6	68.7
VICTORVILLE/GEORGE AFB, CA	+3.9	64.6	MIAMI, FL	+2.3	79.8
LEWISTON, ID	+3.9	55.8	SEATTLE-TACOMA, WA	+2.3	54.7
GLENDALE/LUKE AFB, AZ	+3.7	74.6	SITKA, AK	+2.3	46.7
BEEVILLE NAS, TX	+3.0	75.1	AUSTIN, TX	+2.2	71.4
PRESCOTT, AZ	+3.0	57.7	EAGLE, CO	+2.2	45.9
TUCSON/DAVIS-MONTHAN AFB, AZ	+2.9	71.9	SAN BERNARDINO/NORTON AFB, CA	+2.1	67.6
ROSWELL, NM	+2.8	62.1	TRUTH OR CONSEQUENCES, NM	+2.1	62.3
WORLAND, WY	+2.8	47.8	PORTLAND, OR	+2.1	56.2
MILES CITY, MT	+2.7	49.5	MISSOULA, MT	+2.0	46.0
MCALLEN, TX	+2.6	77.0	ROCK SPRINGS/SWEETWATER, WY	+2.0	45.7

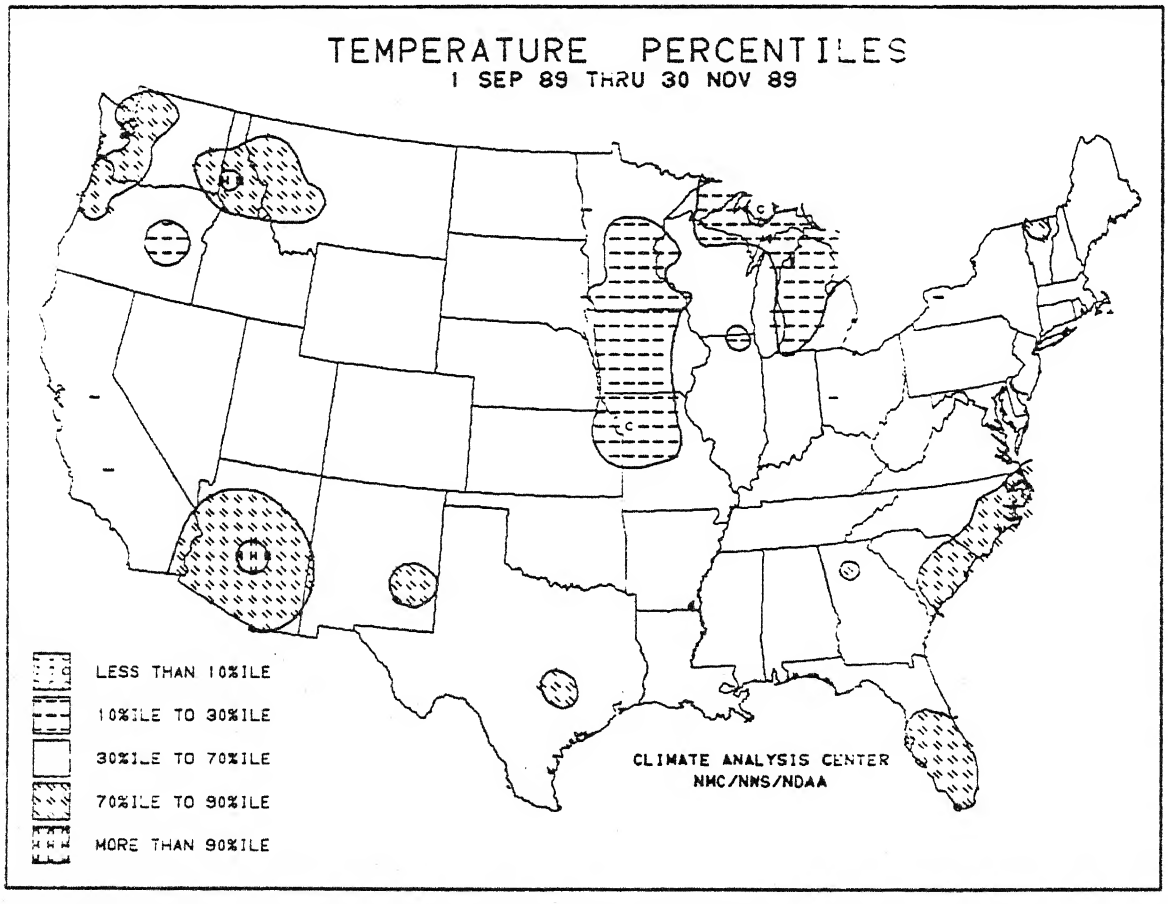


Figure 3. Temperature percentiles for the Autumn (Sep.-Nov.) 1989. Most areas of the contiguous U.S. reported percentiles near the long-term mean as fast moving weather systems kept the duration of anomalous temperature events to a minimum. The exceptions to this included significantly cold conditions (<30%ile) in the upper Midwest and western Great Lakes and substantial warmth (>70%ile) in southern Arizona, portions of the northwestern U.S., and along parts of the southern Atlantic Coast.

TABLE 4. AUTUMN 1989 AVERAGE TEMPERATURES 2.0°F OR MORE BELOW NORMAL.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
WARROAD, MN	-3.7	37.8	MASON CITY, IA	-2.3	45.9
REDDING, CA	-3.5	61.9	MEACHAM, OR	-2.2	43.2
KANSAS CITY/INTL., MO	-3.3	54.5	ROCHESTER, MN	-2.2	44.8
BETTLES, AK	-3.0	17.9	JACKSON, MI	-2.2	48.8
BURNS, OR	-2.9	44.6	FAIRBANKS, AK	-2.1	22.6
DECATUR, IL	-2.8	52.9	MUSKEGON, MI	-2.1	48.4
BIG DELTA, AK	-2.6	23.2	HOULTON, ME	-2.0	41.5
KANSAS CITY/MUNI., MO	-2.5	55.9	LANSING, MI	-2.0	48.0
BARTER ISLAND, AK	-2.4	13.5	GRAND RAPIDS, MI	-2.0	48.8
TOPEKA, KS	-2.4	53.9	OMAHA/EPPLEY, NE	-2.0	51.3
ESCENABA, MI	-2.3	44.1			

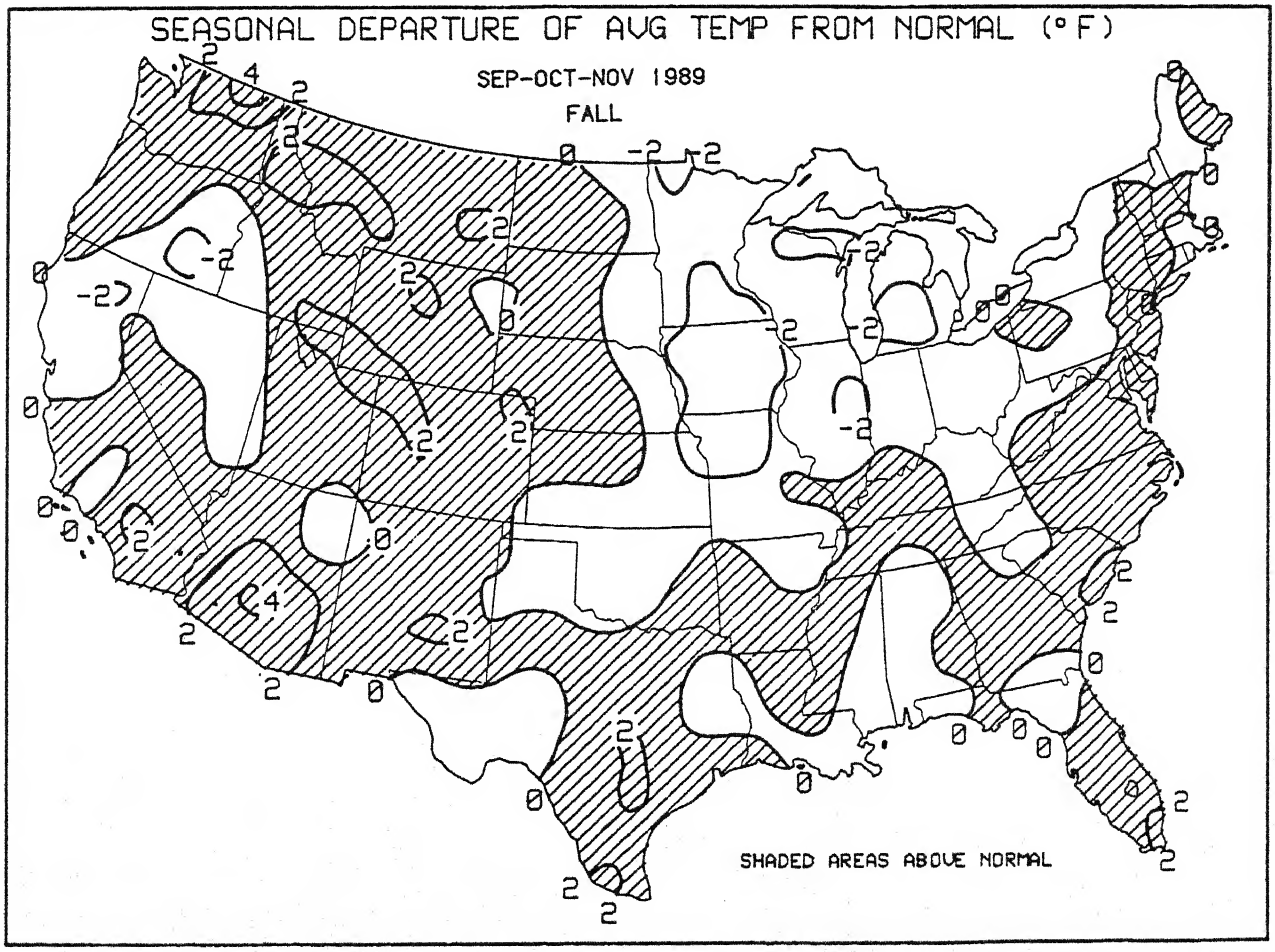


Figure 4. Average temperature departure from normal (°F) during the Autumn (Sep.-Nov.) 1989. Fall temperatures generally averaged within 2°F of normal across the lower 48 states. Slightly milder than normal conditions covered the West and Rockies, portions of the South, and along the Atlantic Coast. Slightly below normal fall temperatures were recorded in the upper Midwest, Great Lakes, middle Mississippi Valley, along the central Gulf Coast, in the Great Basin, and across most of northern and eastern Alaska.

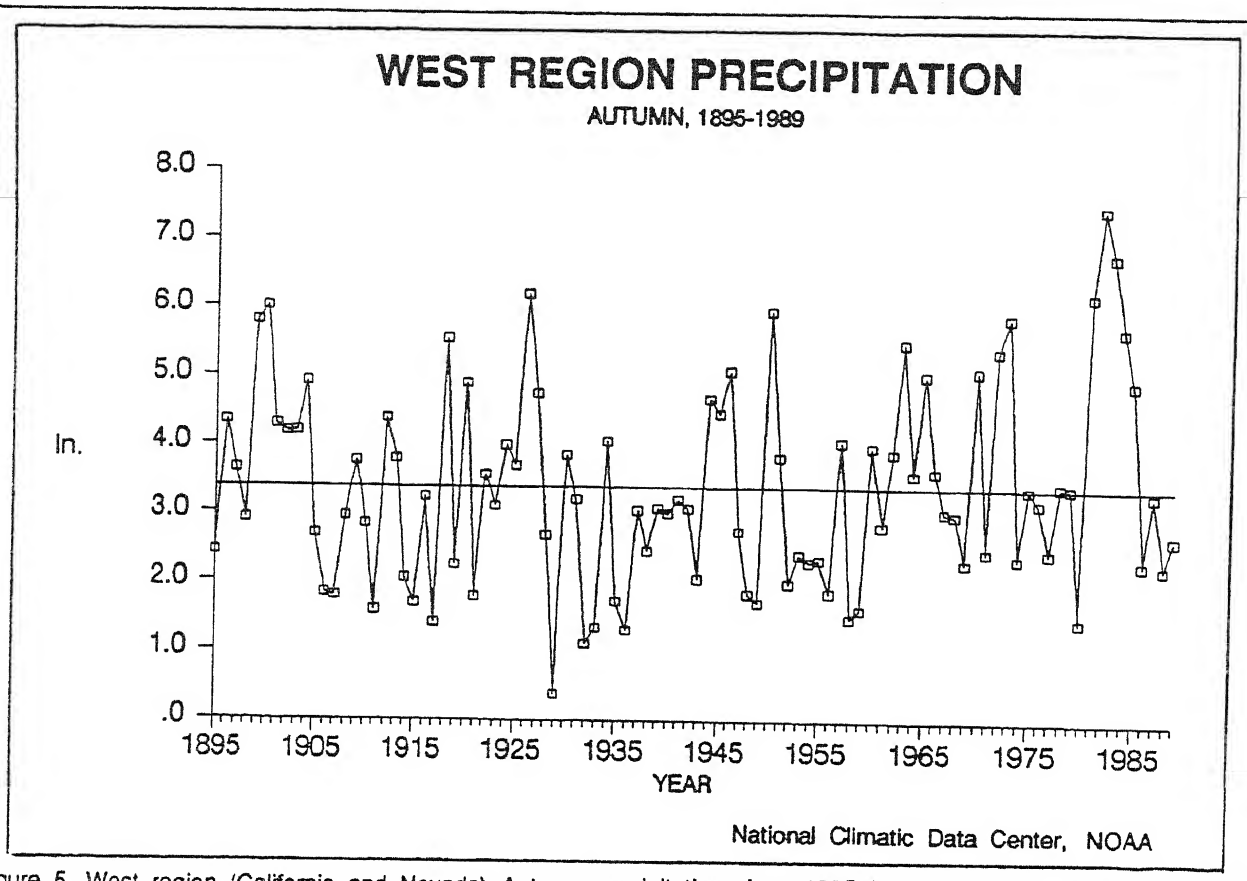
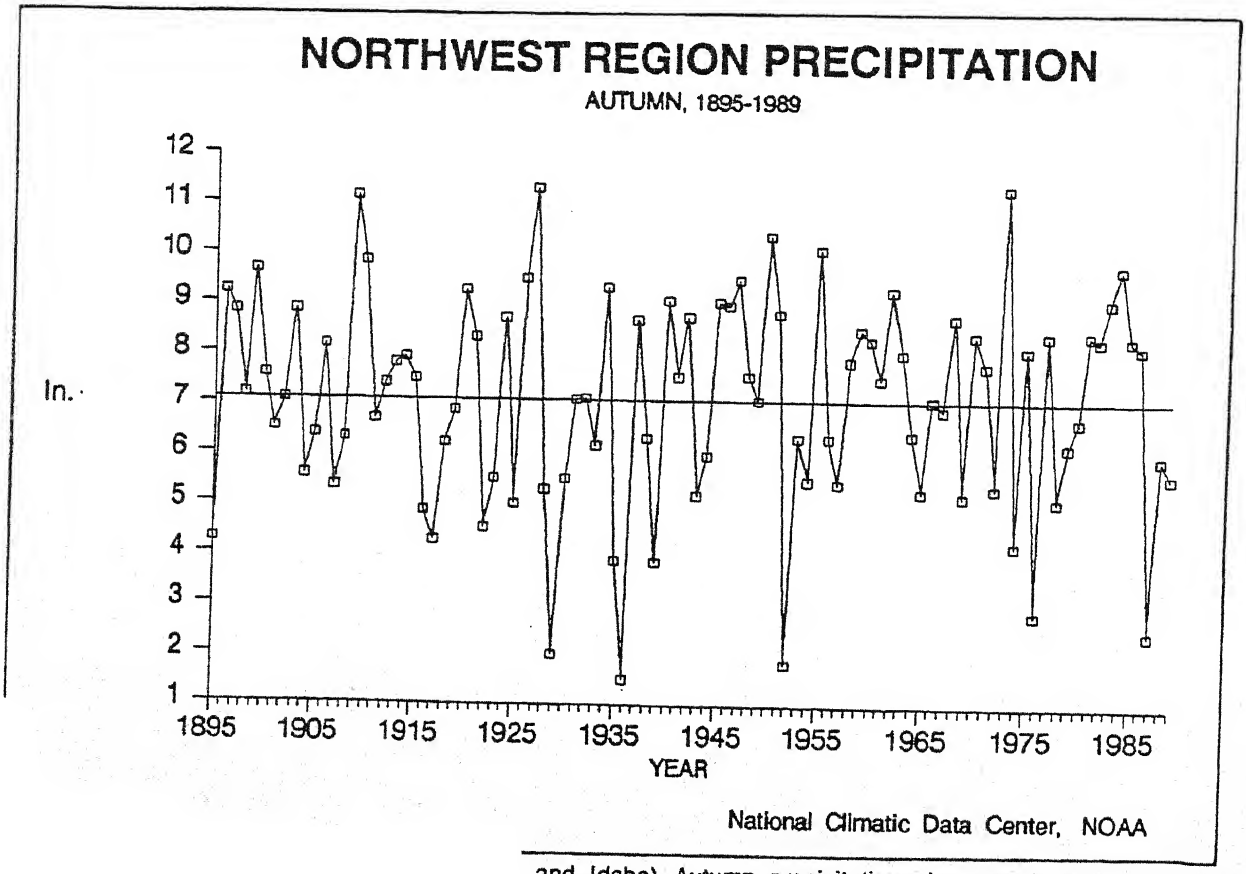


Figure 5. West region (California and Nevada) Autumn precipitation since 1895 from the NCDC. Although dryness during this fall has not been extreme, especially in the northern sections of California and Nevada where above normal Sep.-Nov. precipitation was recorded, this year marked the fourth consecutive autumn with subnormal precipitation after the region experienced some of its wettest autumns in history from 1981-1985.



and Idaho) Autumn precipitation since 1895 from the NCDC.
observed drier than usual conditions during the past 3 autumns
as fall precipitation. Only the northern Cascades and most of
nal Sep.-Nov. precipitation.

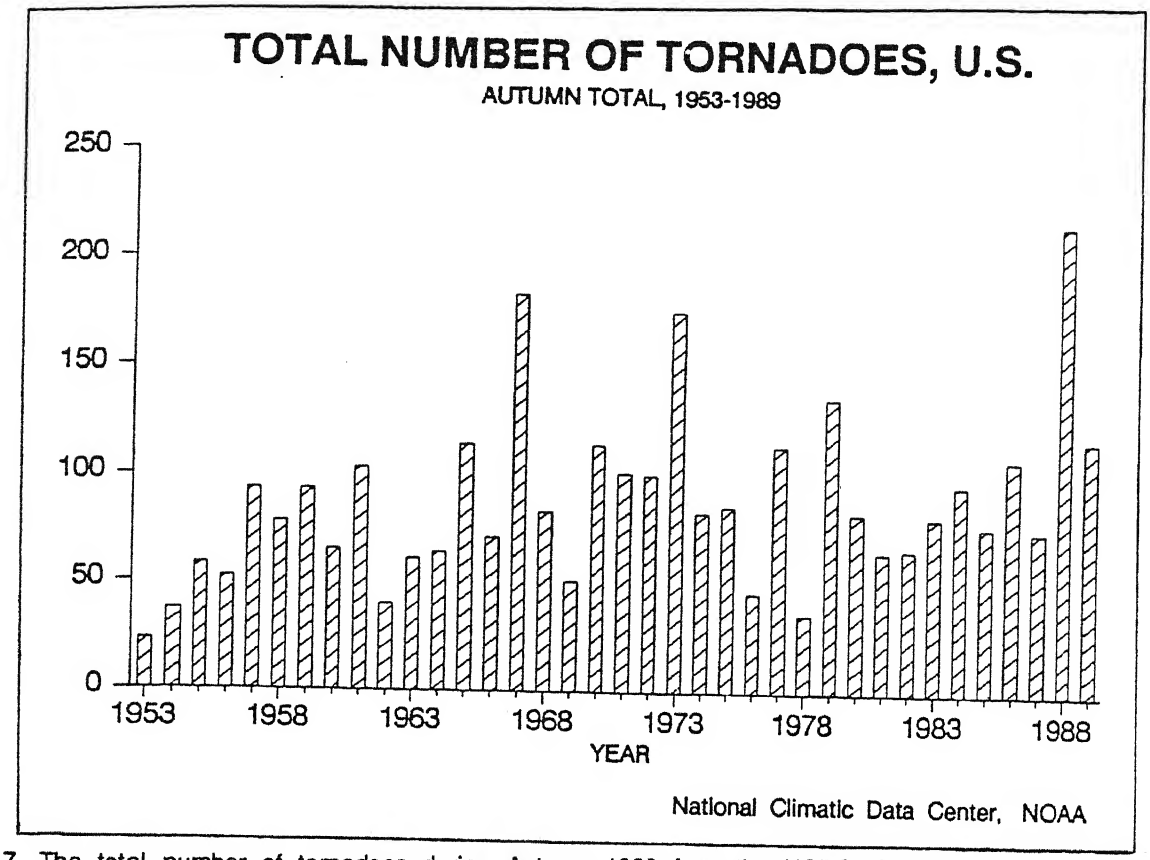


Figure 7. The total number of tornadoes during Autumn 1989 from the NCDC. Several fast-moving cold fronts and greatly contrasting air masses produced numerous strong thunderstorms this Fall, especially during November, as the total number of tornadoes during Autumn 1989 was slightly above the long-term mean (117 versus an average of 88) but much less than last autumn's record outbreak of twisters.

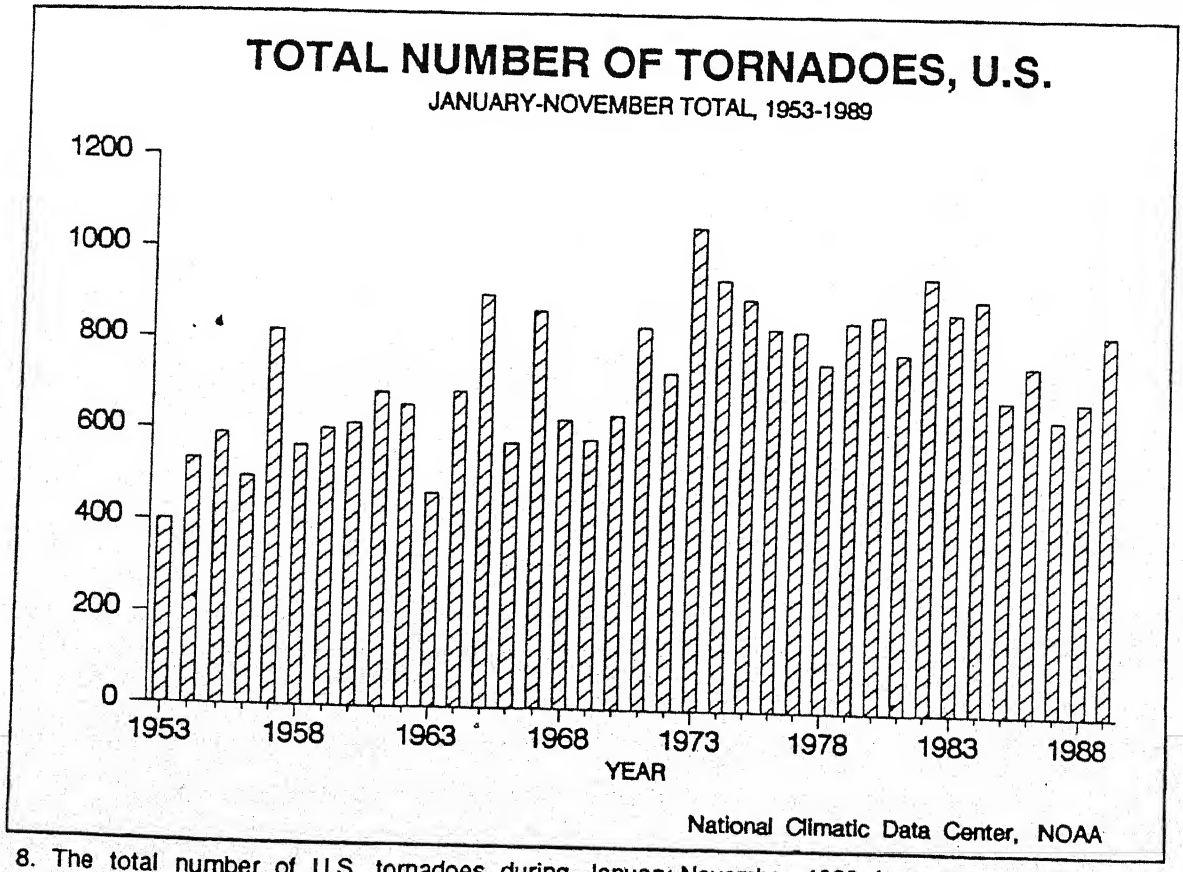
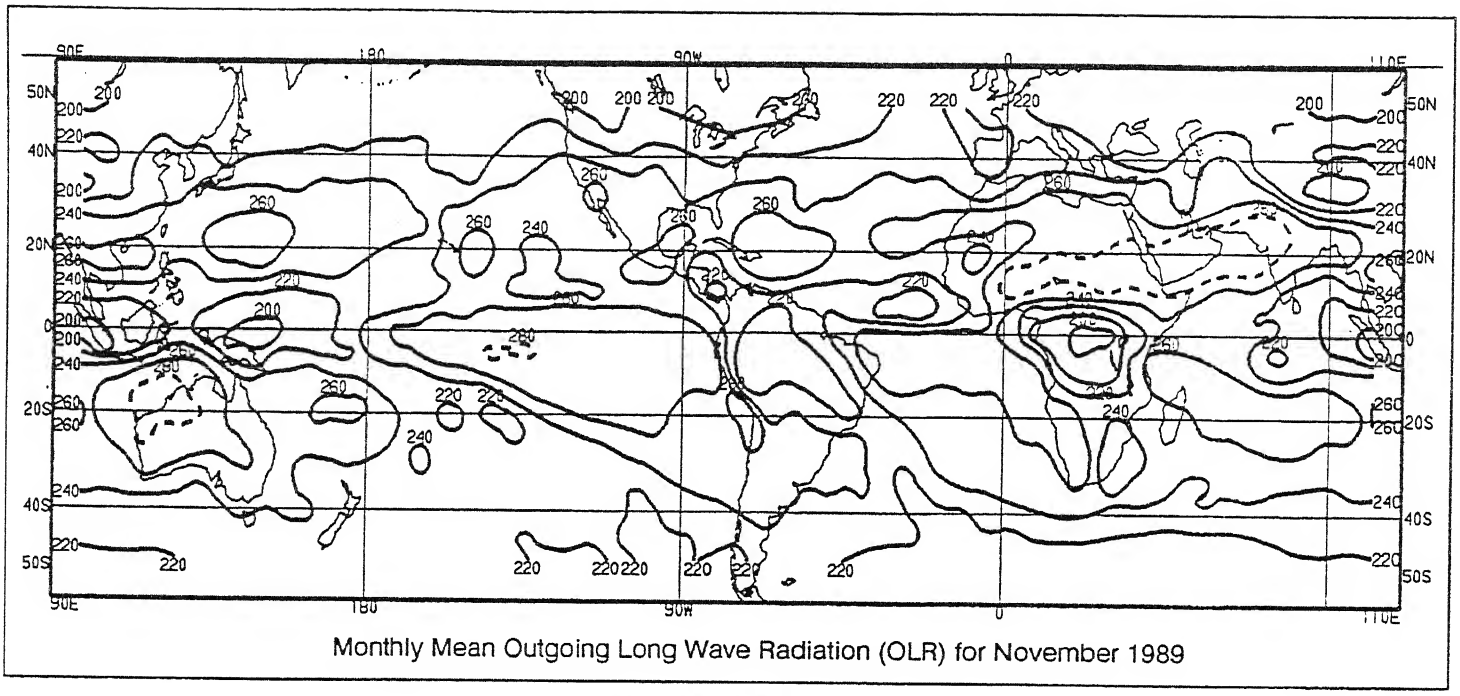


Figure 8. The total number of U.S. tornadoes during January-November 1989 from the NCDC. With a slightly above normal number of tornadoes during this autumn, the year-to-date tornado count is much above normal (829 versus an average of 729) thanks to an active late spring, early summer, and late fall.

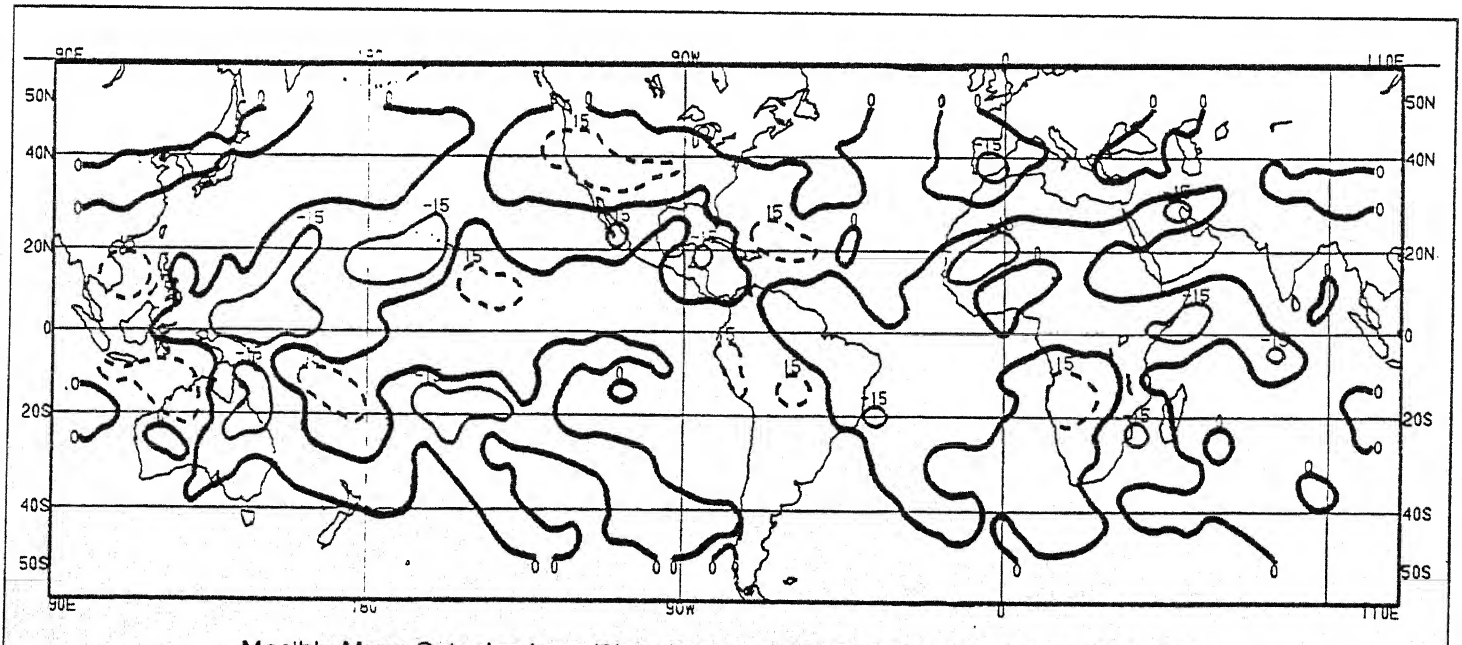


Monthly Mean Outgoing Long Wave Radiation (OLR) for November 1989

EXPLANATION

The mean monthly outgoing long wave radiation (OLR) as measured by the NOAA-9 AVHRR IR window channel by NESDIS/SRL (top). Data are accumulated and averaged over 2.5° areas to a 5° Mercator grid for display. Contour intervals are 20 Wm^{-2}, and contours of 280 Wm^{-2} and above are dashed. In tropical areas (for our purposes 20°N - 20°S) that receive primarily convective rainfall, a mean OLR value of less than 200 Wm^{-2} is associated with significant monthly precipitation, whereas a value greater than 260 Wm^{-2} normally indicates little or no precipitation. Care must be used in interpreting this chart at higher latitudes, where much of the precipitation is non-convective, or in some tropical coastal or island locations, where precipitation is primarily orographically induced. The approximate relationship between mean OLR and precipitation amount does not necessarily hold in such locations.

The mean monthly outgoing long wave radiation anomalies (bottom) are computed as departures from the 1979 - 1988 base period mean. Contour intervals are 15 Wm^{-2}, while positive anomalies (greater than normal OLR, suggesting less than normal cloud cover and/or precipitation) are dashed and negative anomalies (less than normal OLR, suggesting greater than normal cloud cover and/or precipitation) are solid.



Monthly Mean Outgoing Long Wave Radiation (OLR) Anomaly for November 1989